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NewYork Power Authority

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April 26, 1994
JAFP-94-0240

United States Nuclear Regulatory Commission
Region 1
457 Allendale Roa
King of Prussia, PA . 5

Attention: Thomas T. Martin
Regional Administrator

SUBJECT: JAMES A. FITZPA ' NUCLEAR POWER PLANT
RADIOLOGICAL . .ONMENTAL OPERATING REPORT FACILITY
OPERATING LICENSE DPR-59, DOCKET NO. 50-333

Gentlemen:

Enclosed please find the 1993 Radiological Environmental Operating Report which covers the operating period of January 1, 1993 through December 31, 1993. This report is submitted in accordance with the requirements of Amendment 93, Section 7.3.d of the James A. FitzPatrick Nuclear Po Plant Technical Specifications. Distribution for this report is in accordance with the .latory Guide 10.1, Revision 4.

Very truly yours,

HARRY P. SALMON, JR.

HPS:BG:ls
Enclosures

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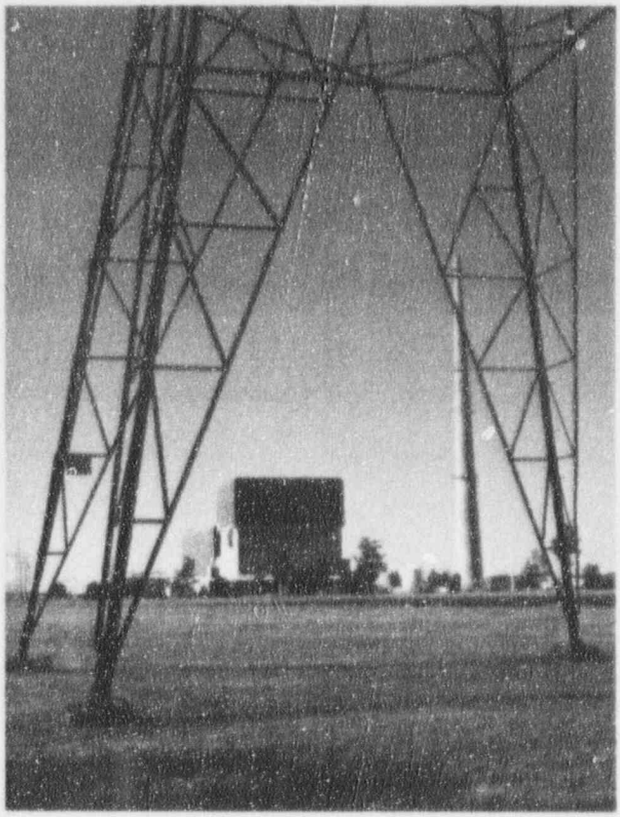
1993 Radiological Environmental Operating Report

James A FitzPatrick Nuclear Power Plant



New York Power Authority

NEW YORK POWER AUTHORITY

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1, 1993 - DECEMBER 31, 1993

FOR

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

FACILITY OPERATING LICENSE DPR-59

DOCKET NUMBER 50-333

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

1.0 EXECUTIVE SUMMARY

The Annual Radiological Environmental Operating Report is published pursuant to Section 7.3.d of the Radiological Effluent Technical Specifications (RETS). The RETS require that the results from the Annual Radiological Environmental Monitoring Program (REMP) be provided to the Nuclear Regulatory Commission (NRC).

This report describes the REMP program and its implementation as required by Technical Specifications. It also contains the analytical results, data evaluation, dose evaluation, and data trends for each environmental sample media. Also included are results of the land use census and the Environmental Laboratories performance in the Quality Assurance/Quality Control interlaboratory comparisons program required by technical specifications.

The REMP is implemented to measure radioactivity in the aquatic and the terrestrial pathways. The aquatic pathways include Lake Ontario fish, water, and lake shore sediment. Measurements of the samples representing these pathways were representative of background concentrations. The 1993 results were consistent with the five year historical data.

Terrestrial pathways were also evaluated and included airborne particulates and radioiodine, milk, food products and direct radiation. Analysis of all terrestrial radiation pathways demonstrated that there has been no detectable increased radiation levels as a result of plant operation. Again, the 1993 results are consistent with five year historical results.

In summary, the analytical results from the 1993 Environmental Monitoring Program demonstrate that the routine operation of the James A. FitzPatrick Nuclear Power Plant had no significant or measurable radiological impact on the environment. The measured concentrations of radionuclides in the off-site environment surrounding the JAFNPP are not increasing as a result of plant operation. In many cases, particularly fish and airborne particulate activity, this report documents a significant downward trend in the concentration of radionuclides in the environment from past weapons testing. The results of the program demonstrate that the operation of the plant did not result in a measurable dose of any significance to the general population, above natural background levels.

2.0 INTRODUCTION

2.1 SITE DESCRIPTION AND BACKGROUND

The New York Power Authority (NYPA) is the owner and licensee of the James A. FitzPatrick Nuclear Power Plant (JAFNPP). JAFNPP is a single unit boiling water reactor (BWR). The plant generates 2436 megawatts (MW) thermal output and 800 megawatts gross electrical output. The plant is located on the eastern portion of the Nine Mile Point promontory approximately one-half mile due east of the Niagara Mohawk Power Corporation (NMPC) Nine Mile Point Nuclear Power Stations (NMPNPS). Initial fuel loading of the JAFNPP reactor core was completed in November of 1974. Initial criticality was achieved in late November 1974 and commercial operation began in July 1975. NMPNPS #1, a 620 MWe (net) BWR, has been operating since 1969. NMPNPS #2, a 1,100 Mwe (net) BWR, has been operating since March 1988.

The plant site is on the southeastern shore of Lake Ontario in the Town of Scriba, Oswego County, New York, approximately seven miles northeast of the City of Oswego, New York. The Universal Transverse Mercator System coordinates of JAFNPP are north 4,819,545.012 m, east 386,968.945 m. Syracuse, New York, located 36 miles south , is the largest metropolitan city in the area. The site consists of approximately 700 acres of partially wooded land and shoreline The land adjacent to the site is primarily used for recreation and residential purposes. The country side to the west, east and south is rolling terrain rising gently up from the lake composed mainly of glacial deposits. Approximately 34 percent of the land area in Oswego County is devoted to farming.

NYPA and NMPNC share the responsibility for the JAFNPP Radiological Environmental Monitoring Program (REMP). Technical Specifications for radiological monitoring of the environment for all three plants are similar. This allows the majority of the sampling and analysis to be a joint undertaking. Data generated by the program is shared by the three facilities. Review and publication of the data is done independently by each organization.

This report is submitted in accordance with Section 7.3.d of the Radiological Effluent Technical Specifications (RETS) to DPR-59, Docket 50-333.

2.2 PROGRAM OBJECTIVES

The objectives of the Radiological Environmental Monitoring Program are to:

1. Measure and evaluate the effects of plant operation on the environs and to verify the effectiveness of the controls on radioactive material sources.

2. Monitor natural radiation levels in the environs of the JAFNPP site.

3. Demonstrate compliance with the various environmental conditions and requirements of applicable state and federal regulatory agencies.

4. Provide information by which the general public can evaluate the environmental aspects of nuclear power using unbiased data.

3.0 PROGRAM DESCRIPTION

To achieve the objectives listed in Section 2.2, an extensive sampling and analysis program is conducted every year. The JAFNPP Radiological Environmental Monitoring Program (REMP) consists of sampling and analysis of various media that include:

- o Shoreline Sediment
- o Fish
- o Surface Waters
- o Air
- o Milk
- o Food Products

In addition, direct radiation measurements are performed using thermoluminescent dosimeters (TLDs). These sampling programs are outlined in Table 3.0-1. The JAFNPP REMP sampling locations are selected and verified by an annual land use census. The accuracy and precision of the program is assured by participation in The United States Environmental Protection Agency (USEPA) Environmental Radioactivity Laboratory Intercomparison Program. In addition to the participation in the EPA Program, quarterly sample splits are routinely provided to the New York State Department of Health for cross checking purposes.

Sample collections for the radiological program are accomplished by a dedicated site environmental staff from both the James A. FitzPatrick Plant and the Nine Mile Point Stations. The site staff is assisted by a contracted environmental engineering company, EA Science and Technology, Inc. (EA).

TABLE 3.0-1

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
AIRBORNE			
Radioiodine and Particulates	Samples from 5 locations: a. 3 samples from off-site locations in different sectors of the highest calculated site average D/Q (based on all licensed site reactors). b. 1 sample from the vicinity of a community having the highest calculated site average D/Q (based on all licensed site reactors). c. 1 sample from a control location 9 to 20 miles distant and in the least prevalent wind direction[d].	Continuous sample operation with sample collection weekly or as required by dust loading, whichever is more frequent.	Radioiodine Canisters: Analyze weekly for I-131. Particulate Samples: Gross beta radioactivity following filter change[b] composite (by location) for gamma isotopic quarterly (as a minimum).
Direct Radiation[e]	32 stations with two or more dosimeters placed as follows: An inner ring of stations in the general area of the site boundary and an outer ring in the 4 to 5 mile range from the site with a station in each of the land based sectors of each ring. There are 16 land based sectors in the inner ring, and 8 land based sectors in the outer ring. The balance of the stations (8) are placed in special interest areas such as population centers, nearby residences, schools, and in 2 or 3 areas to serve as control stations.	Quarterly	Gamma dose monthly or quarterly.

TABLE 3.0-1 (CONTINUED)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
WATERBORNE			
Surface[f]	a. 1 sample upstream. b. 1 sample from the site's most downstream cooling water intake[d].	Composite sample over one month period[g].	Gamma isotopic analysis monthly. Composite for Tritium analysis quarterly[c].
Sediment from Shoreline	1 sample from a downstream area with existing or potential recreational value.	Twice per year.	Gamma isotopic analysis semiannually[c].
INGESTION			
Milk	a. Samples from milch animals in 3 locations within 3.5 miles distant having the highest calculated site average D/Q. If there are none, then 1 sample from milch animals in each of 3 areas 3.5 to 5.0 miles distant having the highest calculated site average D/Q (based on all licensed site reactors)[h]. b. 1 sample from milch animals at a control location (9 to 20 miles distant and in a less prevalent wind direction)[d].	Twice per month, April through December (samples will be collected in January through March if I-131 is detected in November and December of the preceding year).	Gamma isotopic and I-131 analysis twice per month when milch animals are on pasture (April through December); monthly (January through March), if required[c].

TABLE 3.0-1 (CONTINUED)

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples[a] and Locations	Sampling and Collection Frequency[a]	Type and Frequency of Analysis
FISH			
	a. 1 sample of each of 2 commerically or recreationally important species in the vicinity of a site discharge point.	Twice per year.	Gamma isotopic[c] analysis of edible portions.
	b. 1 sample of each of 2 species (same as in a. above or of a species with similar feeding habits) from an area at least 5 miles distant from the site[d].		
FOOD PRODUCTS			
	a. In lieu of the garden cenus as specified in 6.2, samples of at least 3 different kinds of broad leaf vegetation (such as vegetables) grown nearest each of two different off-site locations of highest predicted site average D/Q (based on all licensed site Reactors).	Once during harvest season.	Gamma isotopic[c] analysis of edible portions. (Isotopic to include I-131).
	One (1) sample of each of the similar broad leaf vegetation grown at least 9.3 miles distant in a least prevalent wind direction sector[d].		

NOTES FOR TABLE 3.0-1

(a) It is recognized that, at times, it may not be possible or practical to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question. Actual locations (distance and directions) from the site shall be provided in the Annual Radiological Environmental Operating Report. Calculated site averaged D/Q values and meteorological parameters are based on historical data (specified in the ODCM) for all licensed site reactors.

(b) Particulate sample filters should be analyzed for gross beta 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air is greater than 10 times a historical yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(c) Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the plant.

(d) The purpose of these samples is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites which provide valid background data may be substituted.

(e) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purpose of this table, a thermoluminescent dosimeter may be considered to be one phosphor and two or more phosphors in a pocket may be considered as two or more dosimeters. Film badges shall not be used for measuring direct radiation.

(f) The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream sample" shall be taken in an area beyond, but near, the mixing zone, if practical.

NOTES FOR TABLE 3.0-1 (Continued)

(g) Composite samples should be collected with equipment (or equivalent) which is capable of collecting an aliquot at time intervals which are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure that a representative sample is obtained.

(h) A milk sampling location, as required in Table 1 is defined as a location having at least 10 milking cows present at a designated milk sample location. It has been found from past experience, and as a result of conferring with local farmers, that a minimum of 10 milking cows is necessary to guarantee an adequate supply of milk twice per month for analytical purposes. Locations with less than 10 milking cows are usually utilized for breeding purposes which eliminates a stable supply of milk for samples as a result of suckling calves and periods when the adult animals are dry. In the event that 3 milk sample locations cannot meet the requirement for 10 milking cows, then a sample location having less than 10 milking cows can be used if an adequate supply of milk can reasonably and reliably be obtained based on communications with the farmer.

3.1 SAMPLE COLLECTION METHODOLOGY

3.1.1 SURFACE WATER

Surface water samples are taken from the respective inlet canals of the JAFNPP and the Niagara Mohawk Oswego Steam Station (OSS) located in the City of Oswego. The FitzPatrick Facility draws water from Lake Ontario on a continuous basis. This is used for the "down-current" or indicator sampling point for the Nine Mile Point Site. The OSS inlet canal removes water from Lake Ontario at a point approximately 7.6 miles west of the site. This "up-current" location is considered a control location because of the distance from the site as well as its location relative to prevailing lake current directions and flow pattern of the nearby Oswego River.

Samples from the JAFNPP are composited using automatic sampling equipment which discharges into a compositing tank or bottles. Samples are collected monthly from the compositor and analyzed for gamma emitting radionuclides. Samples from the OSS are also obtained using automatic sampling equipment and collected in a holding tank. Representative samples from this location are obtained weekly and are composited to form a monthly composite sample. The monthly samples are analyzed for gamma emitting radionuclides.

A portion of the monthly samples from each of the locations is saved and composited to form quarterly composite samples. Quarterly composite samples are analyzed for tritium.

In addition to the sample results for the JAFNPP and Oswego Steam Station collection sites, data is presented for the Nine Mile Point Unit 1 and Unit 2 facility inlet canal samples and for samples from the City of Oswego drinking water supply. The latter three locations are not required by the Technical Specifications. These locations are optional sample points which are collected and analyzed to enhance the surface water sampling program. Monthly composite samples from these three locations are analyzed for gamma emitters and quarterly composite samples are analyzed for tritium.

Surface water sample locations are shown in Section 3.3 on Figure 3.3-4.

3.1.2 AIR PARTICULATE/IODINE

The air sampling stations required by the Radiological Effluent Technical Specifications (RETS) are located in the general area of the site boundary. The sampling stations are sited within a distance of 0.2 miles of the site boundary in sectors with the highest calculated meteorological deposition factors (D/Q) based on historical meteorological data. These stations (R-1, R-2, and R-3) are located in the east, east-southeast, and southeast sectors as measured from the center of the NMPNS Unit 2 reactor building. The RETS also require that a fourth air sampling station be located in the vicinity of a year round community having the highest calculated dispersion factor (D/Q) based on historical meteorological data. This station is located in the southeast sector and is designated as location R-4. A fifth station required by the RETS is a control location, designated as station R-5. Station R-5 is located 16.4 miles from the site in the east northeast meteorological sector.

In addition to the RETS required locations, there are ten additional sampling stations. Six of these sampling stations are located within the site boundary and are designated as on-site stations D1, G, H, I, J, and K. These locations are within the site boundary of the JAFNPP and NMPNS. One air sampling station is located off-site in the southwest sector in the vicinity of the City of Oswego and is designated as station G off-site. Three remaining air sampling stations are located in the ESE, SSE, and S sectors and range in distance from 7.2 to 9.0 miles. These are designated as off-site stations D2, E and F respectively.

Each station collects airborne particulates using glass fiber filters (47 millimeter diameter) and radioiodine using charcoal cartridges (2 x 1 inch). The samplers run continuously and the charcoal cartridges and particulate filters are changed on a weekly basis. Sample volume is determined by use of calibrated gas flow meters located at the sample discharge. Gross beta analysis is performed on each particulate filter. Charcoal cartridges are analyzed for radioiodine using gamma spectral analysis.

The particulate filters are composited monthly by location and analyzed for gamma emitting radionuclides.

Air sampling stations are shown in Section 3.3, Figures 3.3-2 and 3.3-3.

3.1.3 MILK

Milk samples are routinely collected from six farms during the year. These farms included five indicator locations and one control location. Samples are collected twice per month, April through December and each sample is analyzed for gamma emitting radionuclides and I-131. Samples are collected in January, February and March in the event that I-131 is detected in November and December of the preceding year.

The selection of milk sample locations is based on maximum deposition calculations (D/Q). Deposition values are generated using average historical meteorological data for the site. The Technical Specifications require three sample locations within 5.0 miles of the site with the highest calculated deposition value. During 1993 there were no milk sample locations within 5.0 miles that were suitable for sampling based on production capabilities. There were however, five optional locations beyond five miles that were sampled as the routine milk sampling program.

The Technical Specifications also require that a sample be collected from a location greater than ten miles from the site and in a less prevalent wind direction. This location is in the southwest sector and serves as the control location.

Milk samples are collected in polyethylene bottles from a bulk storage tank at each sampled farm. Before the sample is drawn, the tank contents are agitated to assure a homogenous mixture of milk and butterfat. Two gallons are collected from each indicator and control locations during the first half and second half of each month. The samples are chilled, preserved and shipped fresh to the analytical laboratory within thirty-six hours of collection in insulated shipping containers.

The milk sample locations are found in Section 3.3 in Figure 3.3-4. (Refer to Table 3.3-1, Section 3.3 for location designations and descriptions).

3.1.4 FOOD PRODUCTS (VEGETATION)

Food products are collected once per year during the late summer harvest season. A minimum of three different kinds of broad leaf vegetation (edible or inedible) are collected from two different indicator garden locations. Sample locations are selected from gardens identified in the annual census that have the highest estimated deposition values (D/Q) based on historical site meteorological data. Control samples are also collected from available locations greater than 9.3 miles distance from the site in a less prevalent wind direction. Control samples are of the same or similar type of vegetation when available.

Food product samples are analyzed for gamma emitters using gamma isotopic analysis.

Food product locations are shown in Section 3.3 on Figure 3.3-5.

3.1.5 FISH SAMPLES

Samples of available fish species are selected from the Nine Mile Point Aquatic Ecology Study which monitors lake fish populations. Fish samples are collected twice per year, once in the spring and again in the fall. Indicator samples are collected from a combination of the four on-site sample transects located off shore from the site. One set of control samples are at an off-site sample transect located off shore 8 - 10 miles west of the site. Available species are selected using the following guidelines:

a) Samples are composed of 0.5 to 1 kilogram of the edible portion only. A maximum of three species per location are used.

b) Samples composed of more than 1 kilogram of single species from the same location are divided into samples of 1 kilogram each. A maximum of three samples per species per location are used. Weight of samples are the edible portions only.

c) Samples are limited to edible and or sport species when available.

Selected fish samples are frozen immediately after collection and segregated by species and location. Samples are shipped frozen in insulated containers for analysis. Edible portions of each sample are analyzed for gamma emitting radionuclides. Fish collection locations are shown in Section 3.3 on Figure 3.3-5.

3.1.6 SHORELINE SEDIMENTS

One kilogram of shoreline sediment is collected at one area of existing or potential recreational value. One sample is also collected from a location beyond the influence of the site. Samples are collected as surface scrapings to a depth of approximately 1 inch. The samples are placed in plastic bags, sealed and shipped to the lab for analysis. Sediment samples are analyzed for gamma emitting radionuclides.

Shoreline sediment locations are shown in Section 3.3 on Figure 3.3-5.

3.1.7 TLD (DIRECT RADIATION)

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. TLDs are supplied and processed quarterly by Teledyne Isotopes of Westwood, New Jersey. Transit and control TLDs accompany each shipment between the site and the vendor's laboratory and accompany the TLDs when they are being placed or collected in the field. TLD data results are corrected using transit and control TLDs data.

Five different regions around the site are evaluated using environmental TLDs.

- o On-site areas (areas within the site boundary not required by the RETS)
- o Site boundary area in each of the sixteen meteorological sectors
- o An outer ring of TLDs (located four to five miles from the site in the eight land based meteorological sectors)

- Special interest TLDs (located at sites of high population density and use)

- Control TLDs located at sites beyond significant influence of the site

Special interest TLDs are located at or near large industrial sites, schools, or nearby towns or communities. Control TLDs are located to the southwest, south and east-northeast of the site at distances of 12.6 to 19.8 miles.

TLDs used for the 1993 program were constructed of rectangular teflon wafers impregnated with 25 percent $CaSO_4$:Dy phosphor. Badges are sealed in a polyethylene package to ensure dosimeter integrity. TLD packages were placed in open webbed plastic holders and attached to supporting structures, such as utility poles.

Environmental TLD locations are shown in Section 3.3 on Figures 3.3-2 and 3.3-3.

3.2 ANALYSIS PERFORMED

The majority of environmental sample analyses are performed by the James A. FitzPatrick Environmental Laboratory (JAFEL). TLD, tritium and surface water I-131 analysis were performed by Teledyne Isotopes (TI). The following samples are analyzed at the JAFEL:

- Air Particulate Filter - gross beta
- Air Particulate Filter Composites - gamma spectral analysis
- Airborne Radioiodine - gamma spectral analysis
- Surface Water Monthly Composites - gamma spectral analysis
- Fish - gamma spectral analysis
- Shoreline Sediment - gamma spectral analysis
- Milk - gamma spectral analysis and I-131
- Special Samples (soil, food products, bottom sediment, etc.) - gamma spectral analysis

Quality assurance samples are analyzed in house and by Teledyne Isotopes N.J. and Teledyne Isotopes Midwest.

3.3 SAMPLE LOCATION MAPS

Section 3.3 includes maps illustrating sample locations. Sample locations referenced as letters and numbers on the report period data tables are consistent with designations plotted on the maps.

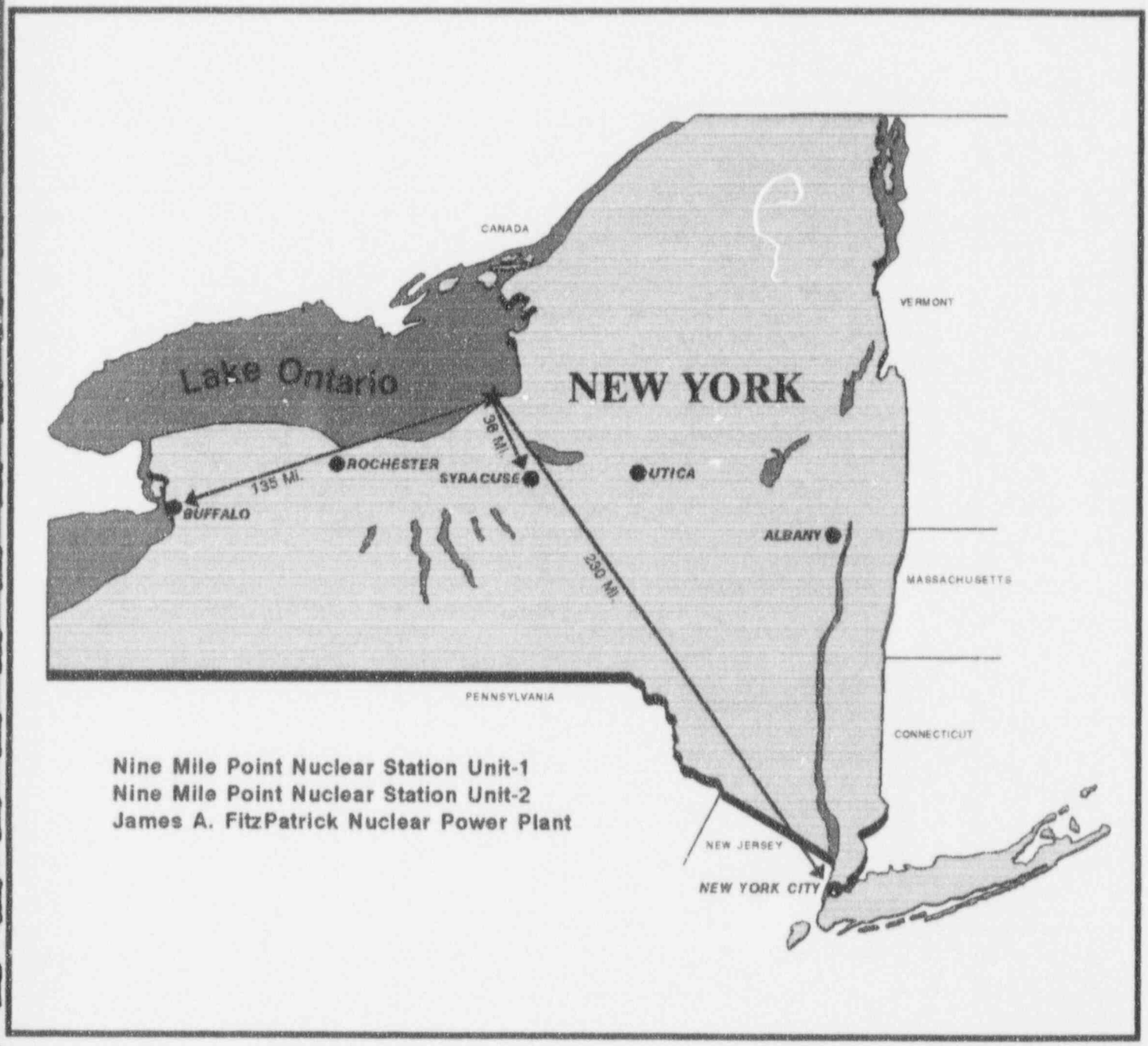
This section also contains an environmental sample location reference table (Table 3.3-1). This table contains the following information:

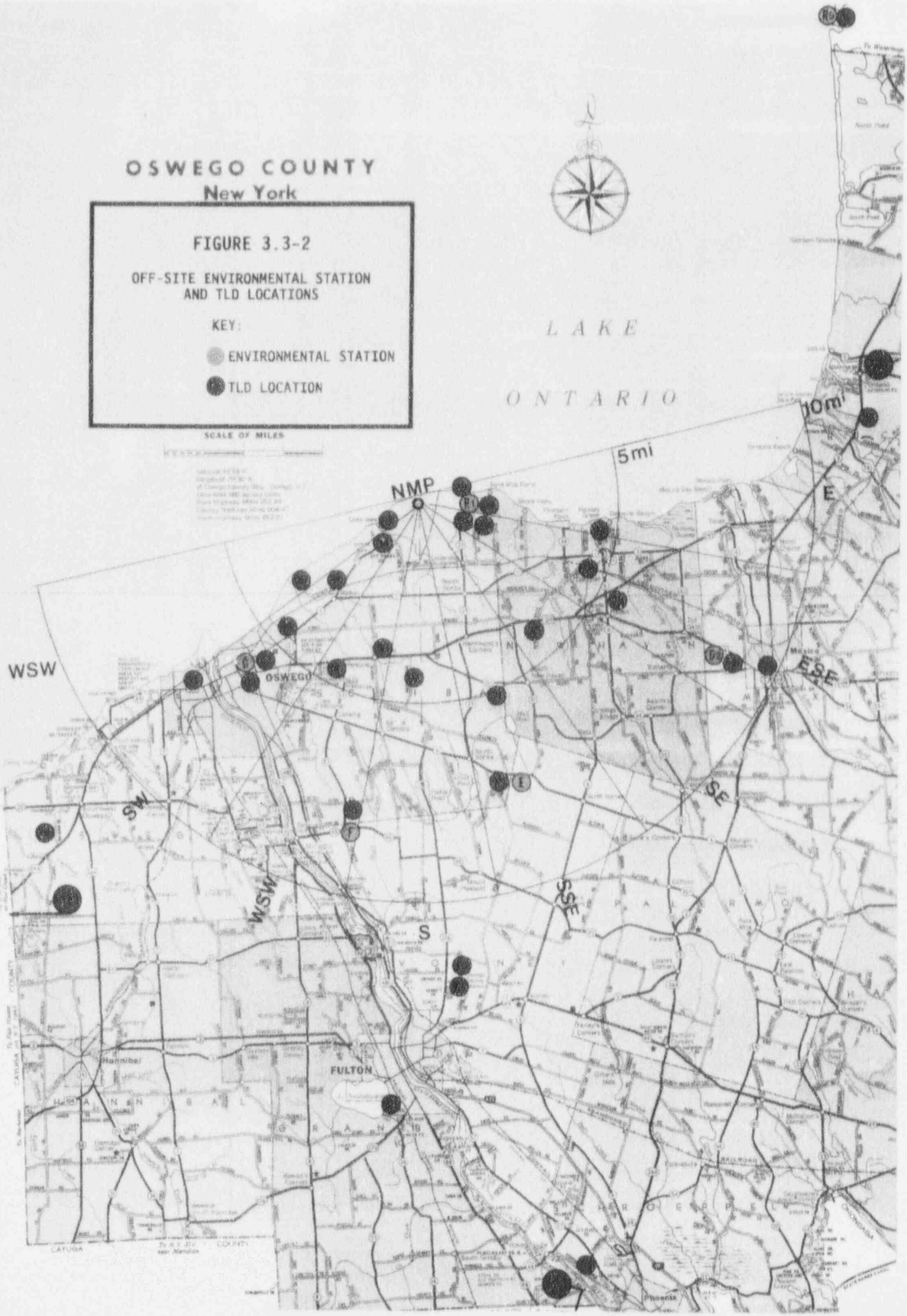
- Sample Medium
- Location designation, this column contains the key for the sample location and is consistent with designation on the sample location maps and on the sample results data tables.
- Location description
- Degrees and distance of the sample location from the site.

3.3.1 LIST OF FIGURES

- Figure 3.3-1 - New York State Map
- Figure 3.3-2 - Off-site Environmental Station and TLD Location Map
- Figure 3.3-3 - On-site Environmental Station and TLD Location Map
- Figure 3.3-4 - Milk Animal Census, Milk Sample Location and Surface Water Sample Location Map
- Figure 3.3-5 - Nearest Resident, Food Product, Shoreline Sediment, Fish Sample Location Map

FIGURE 3.3-1
NEW YORK STATE MAP




OSWEGO COUNTY
New York
FIGURE 3.3-2
OFF-SITE ENVIRONMENTAL STATION
AND TLD LOCATIONS
KEY:
ENVIRONMENTAL STATION
TLD LOCATION
SCALE OF MILES
LAKE
ONTARIO
5mi
NMP
E
ESE
SE
SSE
S
WSW
SW
WSW
OSWEGO
FULTON
Hannibal

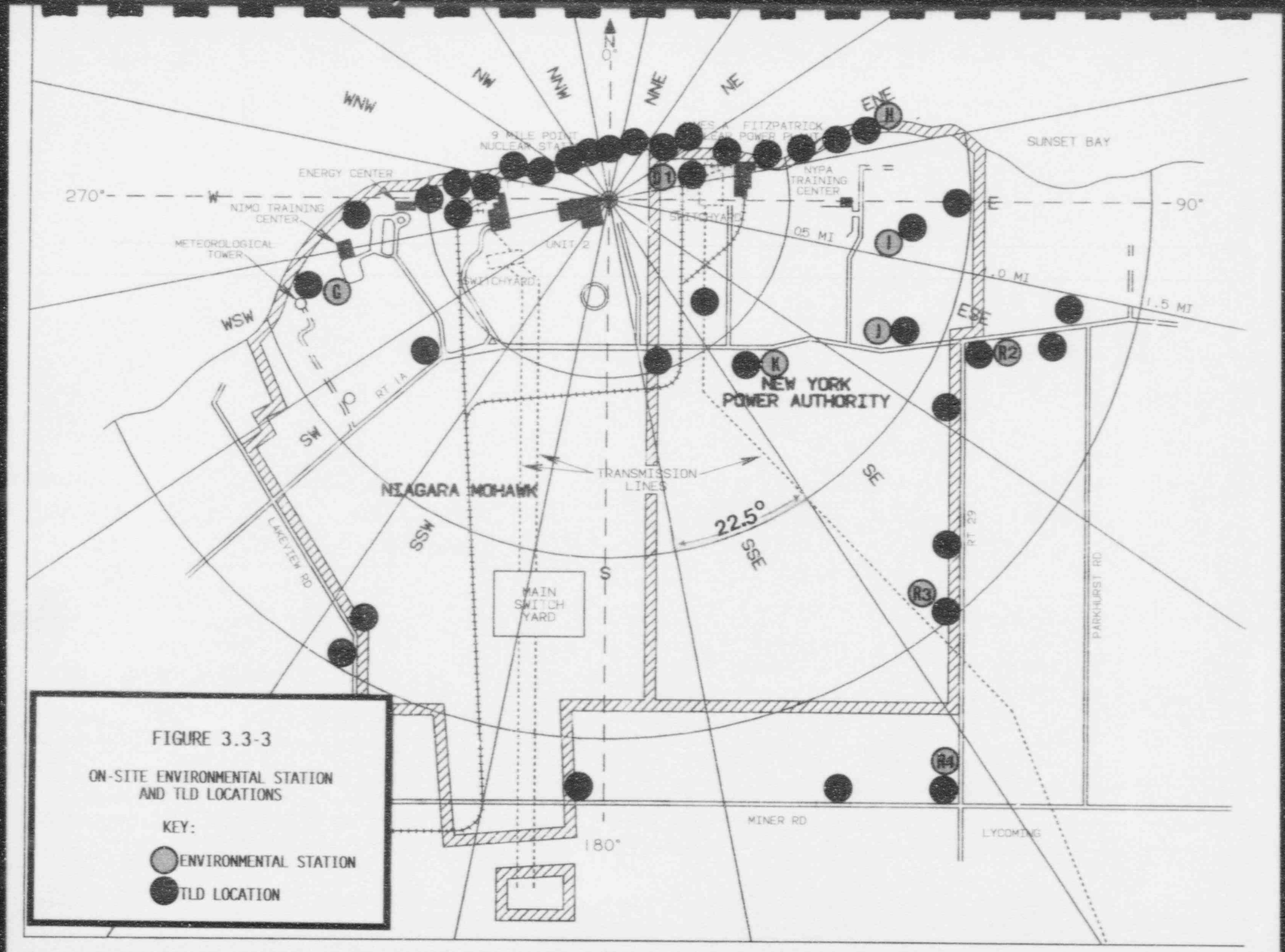


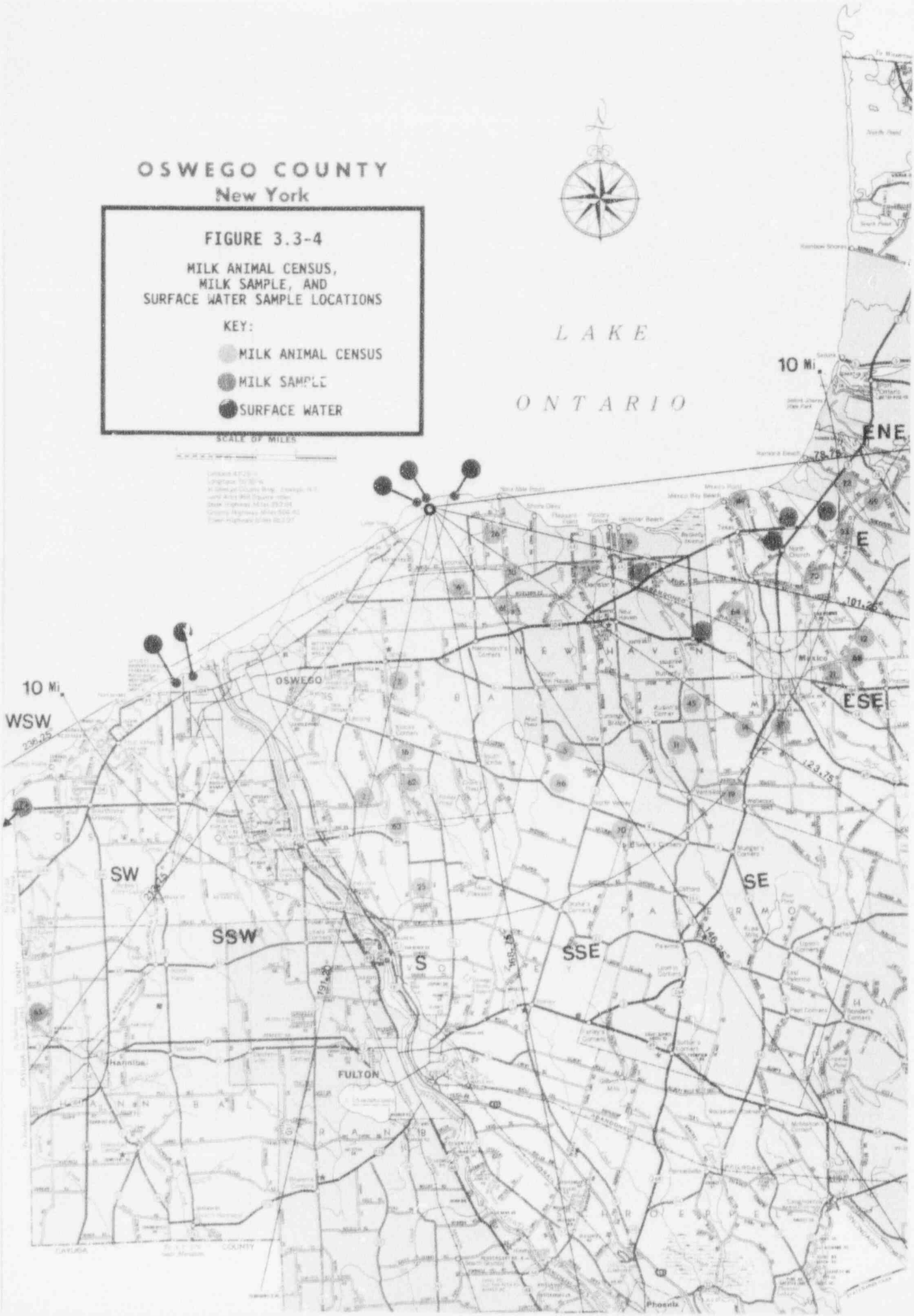
FIGURE 3.3-3

ON-SITE ENVIRONMENTAL STATION AND TLD LOCATIONS

KEY:

ENVIRONMENTAL STATION

TLD LOCATION


OSWEGO COUNTY
New York
FIGURE 3.3-4
MILK ANIMAL CENSUS,
MILK SAMPLE, AND
SURFACE WATER SAMPLE LOCATIONS
KEY:
MILK ANIMAL CENSUS
MILK SAMPLE
SURFACE WATER
SCALE OF MILES
LAKE
ONTARIO
10 Mi.
10 Mi.
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
OSWEGO
FULTON
NEW HAVEN
Mexico
Phoenix

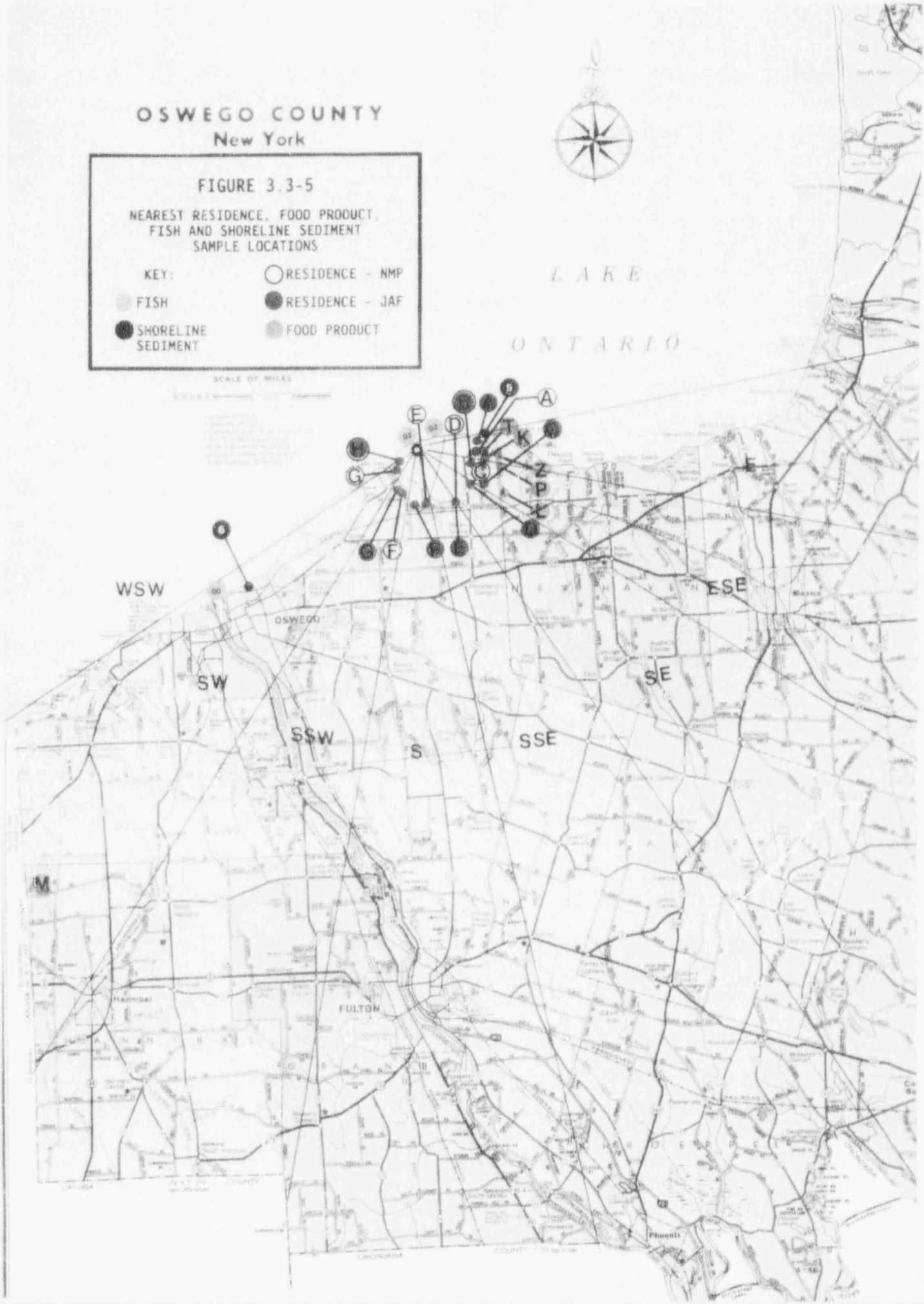

OSWEGO COUNTY
New York
FIGURE 3.3-5
NEAREST RESIDENCE, FOOD PRODUCT, FISH AND SHORELINE SEDIMENT SAMPLE LOCATIONS
KEY:
RESIDENCE - NMP
FISH
RESIDENCE - JAF
SHORELINE SEDIMENT
FOOD PRODUCT
SCALE OF MILES
LAKE
ONTARIO
A
B
C
D
E
F
G
H
K
L
P
Z
WSW
SW
SSW
S
SSE
SE
ESE
OSWEGO
FULTON
Hannibal
Phoenix

TABLE 3.3-1

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Shoreline Sediment	05*	Sunset Bay	80° at 1.5 miles
	06	Langs Beach, Control	230° at 5.8 miles
Fish	02*	Nine Mile Point Transect	315° at 0.3 miles
	03*	FitzPatrick Transect	55° at 0.6 miles
	00*	Oswego Transect	235° at 6.2 miles
Surface Water	03*	FitzPatrick Inlet	70° at 0.5 miles
	08*	Oswego Steam Station	235° at 7.6 miles
	09	Nine Mile Point Unit 1 Inlet	305° at 0.3 miles
	10	Oswego City Water	240° at 7.8 miles
	11	Nine Mile Point Unit 2 Inlet	304° at 0.1 miles
Air Radioiodine and Particulates	R-1*	R-1 Station, Nine Mile Pt. Rd.	88° at 1.8 miles
	R-2*	R-2 Station, Lake Road	104° at 1.1 miles
	R-3*	R-3 Station, Co. Rt. 29	132° at 1.5 miles
	R-4*	R-4 Station, Co. Rt. 29	143° at 1.8 miles
	R-5*	R-5 Station, Montario Point Rd.	42° at 16.4 miles
	D1	D1 On-site Station, On-site	69° at 0.2 miles
	D2	D2 Off-site Station, Co. Rt. 64	117° at 9.0 miles
	E	E Off-site Station, Co. Rt. 4	160° at 7.2 miles
	F	F Off-site Station, Dutch Ridge Rd.	190° at 7.7 miles
	G	G On-site Station, On-site	250° at 0.7 miles
	H	H On-site Station, On-site	71° at 0.8 miles
	I	I On-site Station, On-site	98° at 0.8 miles
	J	J On-site Station, On-site	110° at 0.9 miles
	K	K On-site Station, On-site	132° at 0.5 miles
	G	G Off-site Station, St. Paul St.	225° at 5.3 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Reactor Centerline

TABLE 3.3-1 (CONTINUED)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-luminescent Dosimeters (TLDs)	3	D1 On-site Station	69° at 0.2 miles
	4	D2 On-site Station	140° at 0.4 miles
	5	E On-site Station	175° at 0.4 miles
	6	F On-site Station	210° at 0.5 miles
	7*	G On-site Station	250° at 0.7 miles
	8	R-5 Off-site Station	42° at 16.4 miles
	9	D1 Off-site Location	80° at 11.4 miles
	10	D2 Off-site Location	117° at 9.0 miles
	11	E Off-site Location	160° at 7.2 miles
	12	F Off-site Location	190° at 7.7 miles
	13	G Off-site Location	225° at 5.3 miles
	14*	SW Oswego - Control	226° at 12.6 miles
	15*	West Site Boundary	237° at 0.9 miles
	18*	Energy Information Center	265° at 0.4 miles
	19	East Site Boundary	81° at 1.3 miles
	23*	H On-site Station, On-site	70° at 0.8 miles
	24	I On-site Station, On-site	98° at 0.8 miles
	25	J On-site Station, On-site	110° at 0.9 miles
	26	K On-site Station, On-site	132° at 0.5 miles
	27	North Fence, JAFNPP	60° at 0.4 miles
	28	North Fence, JAFNPP	68° at 0.5 miles
	29	North Fence, JAFNPP	65° at 0.5 miles
	30	North Fence, JAFNPP	57° at 0.4 miles
	31	North Fence, NMP-1	276° at 0.2 miles
	39	North Fence, NMP-1	292° at 0.2 miles
	47	North Fence, JAFNPP	69° at 0.6 miles
	49*	Phoenix, NY - Control	170° at 19.8 miles
	51	Oswego Steam Station, East	233° at 7.4 miles
	52	Oswego Elementary School, East	227° at 5.8 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE 3.3-1 (CONTINUED)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-luminescent Dosimeters (TLDs)	53	Fulton High School	183° at 13.7 miles
	54	Mexico High School	115° at 9.3 miles
	55	Pulaski Gas Substation, Route 5	75° at 13.0 miles
	56*	New Haven Elementary School	123° at 5.3 miles
	58*	County Route 1 and Alcan	220° at 3.1 miles
	75*	North Fence, NMP-2	5° at 0.1 miles
	76*	North Fence, NMP-2	25° at 0.1 miles
	77*	North Fence, NMP-2	45° at 0.1 miles
	78*	East Boundary, JAFNPP	90° at 1.0 miles
	79*	County Route 29	115° at 1.1 miles
	80*	County Route 29	133° at 1.4 miles
	81*	Miner Road	159° at 1.6 miles
	82*	Miner Road	181° at 1.6 miles
	83*	Lakeview Road	200° at 1.2 miles
	84*	Lakeview Road	225° at 1.1 miles
	85*	North Fence, NMP-1	294° at 0.2 miles
	86*	North Fence, NMP-1	315° at 0.1 miles
	87*	North Fence, NMP-1	341° at 0.1 miles
	88*	Hickory Grove Road	97° at 4.5 miles
	89*	Leavitt Road	111° at 4.1 miles
	90*	Route 104 and Keefe Road	135° at 4.2 miles
	91*	County Route 51A	156° at 4.8 miles
	92*	Maiden Lane Road	183° at 4.4 miles
	93*	County Route 53	205° at 4.4 miles
	94*	Co. Rt. 1 & Kocher Road (Co. Rt.63)	223° at 4.7 miles
	95*	Lakeshore Camp Site	237° at 4.1 miles
	96*	Creamery Road	199° at 3.6 miles
	97*	County Route 29	143° at 1.8 miles
	98*	Lake Road	101° at 1.2 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

TABLE 3.3-1 (CONTINUED)

ENVIRONMENTAL SAMPLE LOCATIONS

SAMPLE MEDIUM	LOCATION DESIGNATION	LOCATION DESCRIPTION	DEGREES AND DISTANCE(1)
Thermo-	99	Nine Mile Point Road	88° at 1.8 miles
luminescent	100	County Route 29 and Lake Road	104° at 1.1 miles
Dosimeters	101	County Route 29	132° at 1.5 miles
(TLDs)	102	Oswego County Airport	175° at 11.9 miles
	103	Energy Information Center, East	267° at 0.4 miles
	104	Parkhurst Road	102° at 1.4 miles
	105	Lakeview Road	198° at 1.4 miles
	106	Shoreline Cove, East of NMP-1	274° at 0.3 miles
	107	Shoreline Cove, East of NMP-1	272° at 0.3 miles
	108	Lake Road	104° at 1.1 miles
	109	Lake Road	103° at 1.1 miles
	111	Sterling-Control	214° at 21.8 miles
	113	Baldwinsville-Control	170° at 24.7 miles
Cows Milk	7*	Indicator Location	107° at 5.5 miles
	50*	Indicator Location	93° at 8.2 miles
	55	Indicator Location	95° at 9.0 miles
	60	Indicator Location	90° at 9.5 miles
	4	Indicator Location	113° at 7.8 miles
	65*	Control Location (4/93 - 8/93)	220° at 17.0 miles
	73*	Control Location (8/93 - 12/93)	234° at 13.9 miles
Food Products	K	Indicator Location	96° at 1.7 miles
	L	Indicator Location	115° at 1.9 miles
	T	Indicator Location	84° at 1.6 miles
	P	Indicator Location	101° at 1.9 miles
	Z	Indicator Location	95° at 1.7 miles
	M	Control Location	225° at 15.6 miles

* Technical Specification location

(1) Based on Nine Mile Point Unit 2 Centerline

3.4 LAND USE CENSUS

Technical Specifications require that a milch animal census and a residence census be conducted annually.

The milch animal census is an estimation of the number of cows and goats within an approximate ten mile radius of the Nine Mile Point site. The census is done once per year in the summer. It is conducted by sending questionnaires to previous milk animal owners, and by road surveys to locate any possible new owners. In the event that questionnaires are not answered, the owners are contacted by telephone or in person. The Oswego County Cooperative Extension Service was also contacted to provide any additional information.

The residence census is conducted each year to identify the closest residence in each of the 22.5 degree meteorological sectors to a distance out to five miles. A residence, for the purposes of this census, is a residence that is occupied on a part time basis (such as a summer camp), or on a full time, year round basis. Several of the site meteorological sectors are over Lake Ontario, therefore, there are only eight sectors over land where residences are located within five miles.

In addition to the milch animal and residence census a garden census is performed. The census is conducted each year to identify the gardens near the site that are to be used for the collection of food product samples. The results of the garden census are not provided in this report. The results are used only to identify appropriate sample locations. The garden census is not required by the Technical Specifications if broadleaf vegetation sampling and analysis is performed.

3.5 CHANGES AND EXCEPTIONS TO THE PROGRAM

3.5.1 The following change was implemented during the 1993 sampling program.

A. The control milk sampling location was changed in August of 1993. The new control location is designated as location No. 73 and is located 13.9 miles from the site in the SW sector at 234°. The original control milk location was sold by the owner and ceased milk production.

5.3.2 The following exception was taken during the 1993 sampling program.

A. The fourth quarter 1993 TLD results (direct radiation) for monitoring stations 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, and 19 were determined to be invalid due to an equipment problem experienced by the analysis vendor. Results for this period for the noted stations is reported using results from a backup TLD monitoring program. The backup program utilizes Panasonic's 814 dosimeters and is implemented by the J.A. FitzPatrick N.P.P. Environmental Laboratory. Results for the remaining stations for the fourth quarter were determined to be correct and are reported as submitted by the analysis vendor.

3.6 DEVIATION FROM THE PROGRAM

Exceptions to the 1993 sample program concerns those samples or monitoring requirements which are required by the Technical Specifications. This section addresses the reporting requirements of Section 6.1.a of the RETS.

The following are deviations from the program specified by the Technical Specifications:

A. Air Sampling Stations

The air sampling pump at the R-5, off-site Environmental Sampling Station was inoperable from July 6, 1993 (1030 hours) to July 7, 1993 (1400 hours). The inoperability was caused by technician error, failure to reset pump.

The air sampling pump at the R-4, off-site Environmental Sampling Station was inoperable from October 14, 1993 (1400 hours) to October 14, 1993 (1545 hours). The inoperability was caused by maintenance on electrical lines feeding the station sampling pump.

3.7 STATISTICAL METHODOLOGY

There are a number of statistical calculation methodologies used in evaluating the data from the environmental monitoring program. These methodologies include determination of standard deviation, the mean and associated error for the mean and the lower limit of detection (LLD).

3.7.1 ESTIMATION OF THE MEAN AND STANDARD DEVIATION

The mean, ($\bar{X}$), and standard deviation, (s), were used in the reduction of the data generated by the sampling and analysis of the various media in the JAFNPP Radiological Environmental Monitoring Program (REMP). The following equations were utilized to compute the mean ($\bar{X}$) and the standard deviation (s):

A. Mean

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{N}$$

where,

$\bar{X}$ = estimate of the mean.
i = individual sample, i.
N, n = total number of samples with positive indications.
X_i = value for sample i above the lower limit of detection.

B. Standard Deviation

$$s = \left[\frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{(N-1)} \right]^{1/2}$$

where,

X = mean for the values of X

s = standard deviation for the sample population.

3.7.2 ESTIMATION OF THE MEAN AND THE ESTIMATED ERROR FOR THE MEAN

In accordance with program policy, two recounts of samples are performed when the initial count indicates the presence of a plant related radionuclide(s). When a radionuclide is positively identified in two or more counts, the analytical result for the radionuclide is reported as the mean of the positive detections and the associated propagated error for that mean. In cases where more than one positive sample result is available, the mean of the sample results and the estimated error for the mean are reported in the Annual Report.

The following equations were utilized to estimate the mean ($\bar{X}$) and the associated propagated error.

A. Mean

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{N}$$

where,

$\bar{X}$ = estimate of the mean.
i = individual sample, i.
N,n = total number of samples with positive indications.
X_i = value for sample i above the lower limit of detection.

B. Error of the Mean (Reference 18)

$$\text{ERROR MEAN} = \frac{\left[\sum_{i=1}^{n} (\text{ERROR})^2\right]^{1/2}}{N}$$

where,

ERROR MEAN	=	propagated error
i	=	individual sample
ERROR	=	1 sigma* error of the individual analysis
N, n	=	number of samples with positive indications

* Sigma (σ)

Sigma is the greek letter used to represent the mathematical term Standard Deviation. Standard Deviation is a measure of dispersion from the arithmetic mean of a set of numbers.

3.7.3 LOWER LIMIT OF DETECTION (LLD)

The LLD is the predetermined concentration or activity level used to establish a detection limit for the analytical procedures.

The LLDs are specified by the Technical Specifications for radionuclides in specific media and are determined by taking into account the overall measurement methods. The equation used to calculate the LLD is:

$$LLD = \frac{4.66\ s_b}{(E)\ (V)\ (2.22)\ (Y)\ \exp(-\lambda\Delta t)}$$

Where:

LLD is the *a priori* lower limit of detection, as defined above (in picocurie per unit mass or volume);

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample, as appropriate (in counts per minute);

E is the counting efficiency (in counts per disintegration);

V is the sample size (in units of mass or volume);

2.22 is the number of disintegrations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

Δt is the elapsed time between sample collection (or end of the sample collection period) and time of counting.

The RETS LLD formula assumes that:

- The counting times for the sample and background are equal.
- The count rate of the background is approximately equal to the count rate of the sample.

In the RETS program, LLDs are used to ensure that minimum acceptable detection capabilities are met with specified statistical confidence levels (95% detection probability with 5% probability of a false negative). Table 3.8-1 lists the RETS program required LLDs for specific media and radionuclides as specified by the NRC. The LLDs actually achieved are routinely much lower than those specified by the RETS.

3.8 COMPLIANCE WITH REQUIRED LOWER LIMITS OF DETECTION (LLD)

Table 6.1-3 of the Radiological Effluent Technical Specification (RETS) specifies the detection capabilities for environmental sample analysis (see Report Table 3.8-1). Section 7.3.d of the RETS requires that a discussion of all analyses for which the required LLDs specified were not routinely achieved be included in the Annual Radiological Environmental Operating Report. Section 3.8 is provided pursuant to this requirement.

3.8.1 All sample analyses performed in 1993, required by the RETS, achieved the Lower Limit of Detection (LLD) specified by RETS Table 6.1-3.

TABLE 3.8-1

REQUIRED DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

LOWER LIMIT OF DETECTION (LLD)

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/l)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
gross beta	4	0.01				
H-3	3,000					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr/Nb-95	15					
I-131[(a)]	15	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba/La-140	15			15		

(a) No drinking water pathway exists at the Nine Mile Point Site under normal operating conditions due to the direction and distance of the nearest drinking water intake. Therefore, an LLD value of 15 pCi/liter is used.

4.0 SAMPLE SUMMARY TABLES IN BRANCH TECHNICAL POSITION FORMAT

All sample data is summarized in table form. The tables are titled "Radiological Monitoring Program Annual Summary" and use the following format as specified in the NRC Branch Technical Position:

Column

1 Sample medium.

2 Type and number of analyses performed.

3 Required Lower Limits of Detection (LLD), see Section 3.8, Table 3.8-1. This wording indicates that inclusive data is based on 4.66 s_b (sigma) of background (see Section 3.7).

4 The mean and range of the positive measured values of the indicator locations.

5 The mean, range, and location of the highest indicator annual mean. Location designations are keyed to Table 3.3-1 in Section 3.3.

6 The mean and range of the positive measured values of the control locations.

7 The number of nonroutine reports sent to the Nuclear Regulatory Commission.

NOTE: Only positive measured values are used in statistical calculations.

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1993

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) / Range	Location (b) of Highest Annual Mean: Locations & Designation	Mean (a) / Range	Control Location: Mean (a) / Range	Number of Nonroutine Reports
Surface (Lake) Water (pCi/liter)	H-3 (8):	3000	242 (4/4) 200 - 280	No. 3 0.5 @ 70°	242 (4/4) 200 - 280	188 (4/4) 160 - 230	0
	GSA (24):						
	Mn-54	15	<LLD		<LLD	<LLD	0
	Fe-59	30	<LLD		<LLD	<LLD	0
	Co-58	15	<LLD		<LLD	<LLD	0
	Co-60	15	<LLD		<LLD	<LLD	0
	Zn-65	30	<LLD		<LLD	<LLD	0
	Zr-95	15	<LLD		<LLD	<LLD	0
	Nb-95	15	<LLD		<LLD	<LLD	0
	I-131	15	<LLD		<LLD	<LLD	0
	Cs-134	15	<LLD		<LLD	<LLD	0
	Cs-137	18	<LLD		<LLD	<LLD	0
	Ba/La-140	15	<LLD		<LLD	<LLD	0

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1993

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Shoreline Sediment (pCi/g-dry)	GSA (4):						
	Cs-134	0.15	<LLD		<LLD	<LLD	0
	Cs-137	0.18	0.32 (2/2) 0.18 - 0.46	No. 5 1.5 @ 80°	0.32 (2/2) 0.18 - 0.46	0.027 (1/2) 0.027-0.027	0
Fish (pCi/g-wet)	GSA (27):						
	Mn-54	0.13	<LLD		<LLD	<LLD	0
	Fe-59	0.26	<LLD		<LLD	<LLD	0
	Co-58	0.13	<LLD		<LLD	<LLD	0
	Co-60	0.13	<LLD		<LLD	<LLD	0
	Zn-65	0.26	<LLD		<LLD	<LLD	0
	Cs-134	0.13	<LLD		<LLD	<LLD	0
	Cs-137	0.15	0.028 (8/17) 0.018 - 0.035	No. 03 0.6 @ 55°	0.028 (4/8) 0.025 - 0.035	0.033(2/10) 0.030-0.036	0
Food Products (pCi/g-wet)	GSA (20):						
	I-131	0.06	<LLD		<LLD	<LLD	0
	Cs-134	0.06	<LLD		<LLD	<LLD	0
	Cs-137	0.08	<LLD		<LLD	0.008 (1/6) 0.008-0.008	0

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1993

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Mean (a) Designation Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Milk (f) (pCi/liter)	GSA (108):					
	Cs-134	15	<LLD	<LLD	<LLD	0
	Cs-137	18	<LLD	<LLD	<LLD	0
	Ba/La-140	15	<LLD	<LLD	<LLD	0
	I-131(108):	1	<LLD	<LLD	<LLD	0

RADIOLOGICAL MONITORING PROGRAM ANNUAL SUMMARY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT DOCKET NO. 50-333
OSWEGO COUNTY, STATE OF NEW YORK JANUARY - DECEMBER 1993

Medium (units)	Type and Number of Analysis	LLD	Indicator Locations: Mean (a) Range	Location (b) of Highest Annual Mean: Locations & Designation	Mean (a) Range	Control Location: Mean (a) Range	Number of Nonroutine Reports
Air Particulate and Radioiodine (d) (pCi/m^3)	G.B. (265):	0.01	0.014 (212/212) 0.005 - 0.025	R-2 1.1 @ 104°	0.015 (53/53) 0.006 - 0.023	0.013 (53/53) 0.007 - 0.022	0
	I-131(265):	0.07	<LLD		<LLD	<LLD	0
	GSA (60):						
	Cs-134	0.05	<LLD		<LLD	<LLD	0
	Cs-137	0.06	<LLD		<LLD	<LLD	0
TLD (mrem per standard month)	Gamma Dose (128):	N/A	4.9 (120/120) (c) 3.2 - 11.7	No. 85 0.2 @ 294°	9.9 (4/4) (e) 9.0 - 11.7	4.4 (8/8) 3.6 - 5.3	0

ANNUAL SUMMARY TABLE NOTES

* = Data for the Annual Summary Tables is based on RETS required samples only.

N/A = Not applicable.

(a) = Fraction of detectable measurement to total measurement.

(b) = Location is distance in miles, and direction in compass degrees. Location numbers keyed to Table 3.3-1 and results table location designation numbers.

(c) = Indicator TLD locations are: #7, 23, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 15, 18, 56, and 58. Control TLDs are all TLDs located beyond the influence of the site (#14, 49).

(d) = Indicator samples from environmental stations R1 off-site, R2 off-site, R3 off-site, and R4 off-site. Control samples are samples from R5 off-site environmental station.

(e) = This dose is not representative of doses to a member of the public since this area is located near the north shoreline which is in close proximity to the generating facility and is not accessible to members of the public (see Section 5.2.4, TLDs).

(f) = The RETS criteria for indicator milk sample locations includes locations within 5.0 miles of the site. There are no milk sample locations within 5.0 miles of the site. Therefore, milk samples are collected from locations greater than 5.0 miles from the site based on the location D/Q values.

5.0 RESULTS EVALUATION AND DISCUSSION

Each year the results of the Annual Radiological Environmental Monitoring Program are evaluated considering natural processes in the environment and the collection of past environmental radiological data. A number of factors are considered in the course of evaluating and interpreting the Annual Environmental Radiological Data. This interpretation can be made using several methods including trend analysis, population dose, risk estimates to the general population based on environmental concentrations, effectiveness of plant effluent controls and specific research areas. The report not only presents the data collected during the 1993 sample program but also assesses the significance of radionuclides detected in the environment. It is important to note that detection of a radionuclide is not, of itself, an indication of environmental significance. Evaluation of the impact of the radionuclide in terms of potential increased dose to man, in relation to natural background, is necessary to determine the true significance of any detection.

There are four separate groups of radionuclides that were measured in the environment in the media analyzed for the 1993 sampling program. The first of these groups consists of those radionuclides that are naturally occurring. The environment contains a broad inventory of naturally occurring radioactive elements. Components of natural background include external cosmic and terrestrial radiation, radionuclides deposited in the body, and radon and its decay products. Naturally occurring radionuclides, such as Th-228, Ra-226, Be-7 and K-40 contribute, along with radon, to the annual per capita background dose which is equal to approximately 300 mrem per year (Reference 17). Comparisons of program samples to natural background radiation are made throughout this section to help put program results into perspective and to aid the reader in determining what, if any, significance is associated with the Radiological Environmental Monitoring Program (REMP) results.

The second group of radionuclides that were detected are a result of the detonation of thermonuclear devices in the earth's upper atmosphere. Atmospheric nuclear testing during the early 1950s produced a significant inventory of radionuclides presently found in the lower atmosphere as well as in ecological systems. In 1963 an Atmospheric Test Ban Treaty was signed. Since the treaty, the global inventory of man made radioactivity in the environment has been greatly reduced through the

decay of short lived radionuclides and the removal of radionuclides from the food chain by such natural processes as weathering and sedimentation. This process is referred to in this report as ecological cycling. Since 1963, several atmospheric weapons tests have been conducted by the People's Republic of China. In each case, the usual radionuclides associated with nuclear detonations were detected for several months following the test and then after a peak detection period, diminished to a point where most could not be detected. Although reduced in frequency, atmospheric testing continued into the 1980's. The resulting fallout or deposition from these most recent tests has influenced the background radiation in the vicinity of the site and was evident in many of the sample medias analyzed over the years with the highest concentration noted in samples for the 1981 Environmental Surveillance Program. Cs-137 was the major byproduct of this testing and is still detected in a number of environmental media.

A third group of radionuclides was detected as a result of the Chernobyl accident which occurred in the Soviet Union in April 1986. The resulting fallout or deposition from this accident influenced the background radiation in the vicinity of the site and was easily detected in many of the sample media analyzed during 1986. Quantities of Nb-95, Ru-103, Ru-106, I-131, La-140, Cs-134, and Cs-137 were detected in air particulate samples during May and June of 1986. Milk samples collected and analyzed after April, 1986 contained measurable concentrations of I-131 and Cs-137. The origin of these radionuclides was a direct result of fallout from the Chernobyl accident.

The fourth group of radionuclides that may be detected in the environment are those that are related to nuclear power technology. These radionuclides are the byproduct of the operation of light water reactors. These byproduct radionuclides are the same as those produced in atmospheric weapons testing and found in the Chernobyl fallout. This commonality makes an evaluation of the source of these radionuclides that may be detected in environmental samples difficult, if not impossible. During 1993, H-3 and Cs-137 were the only potentially plant-related radionuclides detected in the RETS samples.

A number of factors must be considered in performing radiological sample data evaluation and interpretation. The evaluation is made at several levels including trend analysis and dose to man. An attempt has been made not only to report the

data collected during 1993, but also to assess the significance of the radionuclides detected in the environment as compared to natural and other man-made radiation sources. It is important to note that detected concentrations of radionuclides in the environment as a result of mans technology are very small and are of no or little significance from an environmental or dose to man perspective.

The 1987 per capita dose was determined to be 360 mrem per year from all sources, as noted in the NCRP Report No. 93 (Reference 17). This average dose includes such exposure sources as natural radiation, occupational exposure, weapons testing, consumer products and nuclear medicine. The 1987 per capita dose rate due to natural sources was 300 mrem per year. The per capita radiation dose from nuclear power production nation wide is less than one mrem per year (Reference 10).

The natural background gamma radiation in the environs of the Nine Mile Point Site, resulting from radionuclides in the atmosphere and in the ground, accounts for approximately 60 - 65 mrem per year. This dose is a result of radionuclides of cosmic origin (for example, Be-7), of a primordial origin (Ra-226, K-40, and Th-232) and, to a much smaller extent, of a man-made origin from weapons testing. A dose of 60 mrem per year, as a background dose, is significantly greater than any possible doses as a result of routine operations at the site during 1993.

The results for each sample media is discussed in detail in Section 5.0. This includes a summary of the result, the estimated environmental impact, a detailed review of any relevant detections with a dose to man estimate where appropriate, and an analysis of possible long term and short term trends.

In the routine implementation of the Radiological Environmental Monitoring Program, additional or optional environmental pathway media are sampled and analyzed. These samples are obtained to monitor the secondary pathways and to maintain the analytical data base established in 1975 when the plant began commercial operation. These additional samples include; aquatic vegetation (cladophora), bottom sediment, mollusk, milk (Sr-90), meat, poultry and soil samples. In addition to the optional sample media, additional locations are sampled and analyzed for those pathways required by Technical Specifications. These additional sample locations are obtained to ensure that the important environmental pathways are monitored in a comprehensive manner. Data from additional sample

locations common with the required Technical Specification sample media are included in the data presentation and evaluation. When additional locations are included, the use of this data will be specifically noted in Section 5.0.

Section 6.0 contains the analytical results for the sample media addressed in this report. Tables are provided for each required sample media analyzed during the 1993 program.

Section 7.0, titled HISTORICAL DATA, contains statistics from previous years environmental sampling. The process of determining the impact of plant operation on the environment includes the evaluation of past analytical data, a tool by which trends are discerned. As state-of-the-art detection capabilities improve, data comparison is difficult in some cases. For example, Lower Limits of Detections (LLDs) have improved significantly since 1969 due to technological advance in laboratory procedures and analytical equipment.

5.1 AQUATIC PROGRAM

The aquatic program consists of samples from three environmental pathways. These pathways are:

- Shoreline Sediment
- Fish
- Surface Waters

Section 6.0, Tables 6.1 through 6.4 represent the analytical results for the aquatic samples collected for the 1993 sampling period.

5.1.1 SHORELINE SEDIMENT RESULTS

A. Results Summary

A total of four sediment samples were collected for the 1993 sample program. Small concentrations of Cs-137 were detected in three of the four 1993 samples. Cs-137 was detected in the two samples taken at Sunset Beach which is the indicator location. The Cs-137 concentrations ranged from a minimum of 0.18 pCi/g to a maximum of 0.46 pCi/g. The mean concentration was 0.32 pCi/g. Cs-137 was detected in one of the control location samples at a concentration of 0.027 pCi/g. The source of the Cs-137 detected in the indicator shoreline sediment is considered to be the result of fallout from atmospheric nuclear weapons testing and not from operations at the site. This is based on the fact that Cs-137 was also detected at the control location. The mean level of Cs-137 measured in 1993 samples shows an increase in the mean concentration from 0.13 pCi/g (1991 and 1992) to 0.32 pCi/g measured in 1993. The 1993 results are consistent with results for 1989 and 1990 (0.29 pCi/g). The concentration measured at the control location was 0.027 pCi/g. The calculated potential whole body and skin doses which may result from the measured Cs-137 concentrations are very small and are insignificant when compared to natural background doses.

No other plant related radionuclides were detected in the 1993 shoreline sediment samples.

B. Data Evaluation and Discussion

Shoreline sediment samples are routinely collected twice per year from the shoreline of Lake Ontario. Samples are collected from one indicator location (Sunset Beach), and one control location (Lang's Beach). The first sample collection was made in May at both the indicator and control locations. The second shoreline sample collection was made in October 1993 again, at both the indicator and the control locations. The results of these sample collections are presented in Section 6.0, Table 1. Several radionuclides were detected in sediment samples using gamma spectral analysis.

Three of the detected radionuclides were naturally occurring. K-40 was detected at both the control location and indicator location. The results ranged from 19.6 pCi/g (dry) to 20.5 pCi/g (dry) at the indicator location, and 10.5 pCi/g (dry) to 12.7 pCi/g (dry) at the control location. Concentrations of AcTh-228 and Ra-226, which are naturally occurring, were also detected at both indicator and control locations.

Cs-137 was present in the indicator samples collected for the 1993 program. The mean concentration for these two samples was 0.32 pCi/g (dry). The principle source of the Cs-137 present in the environment has been the atmospheric testing of nuclear weapons. Cs-137 and Cs-134 are both produced in fission reactors and were introduced into the environment from the accident at Chernobyl, but only Cs-137 is found in current weapons test debris. Since Cs-134 has a significantly shorter half-life, detected concentrations of Cs-137 attributable to plant operations (e.g., recent releases), should be accompanied by Cs-134. An absence of such corroborating Cs-134 concentrations would indicate that the presence of Cs-137 in these samples is not distinguishable from the existing background and is attributed primarily to weapons testing and residual concentrations; i.e., not to recent plant operations. This assessment is further substantiated by the presence of Cs-137 in the control sample.

The difference in the concentration of Cs-137 in the control samples may be attributed to the differences in the sediment type at the two locations. Few shoreline regions west of the site contain fine sediment and/or sand which would be representative of the indicator location. It is difficult to obtain control samples which are comparable in physical and chemical characteristics to the indicator samples. Other factors, which include changing lake level and shoreline erosion, further complicate any consistency in shoreline sediment sampling. Soil samples from locations beyond any influence from the site, have contained levels of Cs-137 equal to or greater than the concentration found in 1993 shoreline sediment. Cs-137 in soil samples is attributed to weapons testing fallout. Therefore, most shoreline sediment sample containing soil would also contain Cs-137.

C. Dose Evaluation

The radiological impact of Cs-137 measured in the shoreline sediment can be evaluated on the basis of dose to man. In the case of shoreline sediments, the critical pathway is direct radiation to the whole body and skin. Using the parameters found in Regulatory Guide 1.109, the potential dose to man in mrem per year can be calculated. The following regulatory guide values were used in calculating the dose to man:

- A teenager spends 67 hours per year at the beach area or on the shoreline.
- The sediment has a mass of 40 kg/m^2 (dry) to a depth of 2.5 cm.
- The shoreline width factor is 0.3.
- The maximum measured concentration of 0.46 pCi/g (dry) remains constant for the year.

Using these conservative parameters, the potential dose to the maximum exposed individual (teenager) would be 0.0016 mrem/year to the whole body and 0.0018 mrem/year to the skin. This calculated dose is very small and is insignificant when compared to the natural background annual exposure of approximately 60 mrem.

D. Data Trends

The average Cs-137 concentrations in the shoreline sediment indicator samples for 1993 was 0.32 pCi/g which is approximately equal to the concentration measured in 1989 and 1990. The mean values for 1989 and 1990 were 0.29 pCi/g. The mean concentration for 1993 shows an increase in concentration by a factor of two and one half from the 1991 and 1992 indicator means. The presence of Cs-137 in the control sample was the first positive measurement at the control location since sediment sampling was implemented in 1985.

A review of indicator and control sample results for 1985 - 1988 indicate only naturally occurring radionuclides present in shoreline sediment. The period from 1989 - 1992 show the presence of Cs-137 in the indicator samples. The five year data base shows an emergence of Cs-137 concentrations in 1989 which continues through 1993. The trend since 1989 shows a reduction in Cs-137 concentrations over the four year period to the concentration of 0.13 pCi/g measured in 1992. The mean concentration measured in 1993 is an increase from the two prior years.

Shoreline sediment sampling commenced in 1985. Prior to 1985, no data was available for long term trend analysis.

Tables 1 and 2 in Section 7.0 illustrates historical environmental data for shoreline sediment samples.

5.1.2 FISH SAMPLE RESULTS

A. Results Summary

A total of 27 fish samples were collected for the 1993 sample program. Analysis of the 1993 fish samples exhibited detectable concentrations of radionuclides related to past weapons testing and natural origins (naturally occurring). Small concentrations of Cs-137 were detected in approximately 37% of the total fish samples collected from both the on-site and off-site locations. This percentage is slightly higher than the previous year which had a positive detection in 30% of the samples. The ratio of positive detection to total samples collected was higher for the indicator samples (47%) than for the control samples (27%). Detectable concentrations of K-40, a naturally occurring radionuclide, were found in all fish samples collected for the 1993 program. No other radionuclides were detected in the 1993 fish samples.

The detectable levels of Cs-137 in the fish samples are small. The control and indicator mean concentration values were 0.033 and 0.028 pCi/g respectively. These low levels of Cs-137 represent no significant dose to man or impact on the environment. As noted above, the measured concentrations of Cs-137 in the fish samples are the result of fallout from past weapons testing. Comparable concentrations of Cs-137 are routinely found in samples of other aquatic media such as shoreline sediment, bottom sediment and aquatic vegetation. The potential whole body and critical organ doses calculated as a result of fish consumption by humans is extremely small. The dose that could result from the Cs-137 in fish would be considered background exposures because of the sources of the Cs-137.

The fish sample results demonstrate that plant operations at the Nine Mile Point Site have no measurable radiological environmental impact on the upper levels of the Lake Ontario food chain. The 1993 results continue to show a long term downward trend in fish Cs-137 concentrations with concentrations stabilizing over the last 9 - 10 years. The mean indicator Cs-137 concentration for 1993 and 1986 were the second lowest measured value since the beginning of the surveillance program 20 years ago (1974).

B. Data Evaluation and Discussion

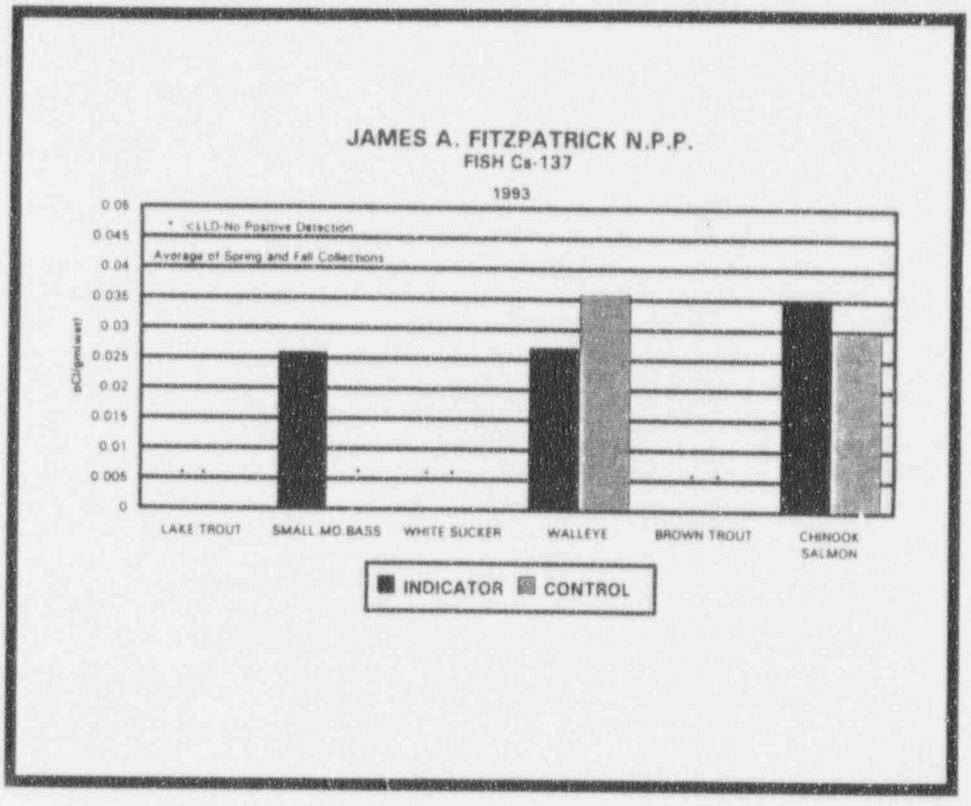
Fish collections were made utilizing gill nets at one location greater than five miles from the site (Oswego Harbor area), and at two locations in the vicinity of the lake discharges for the Nine Mile Point Unit #1 (#02), and the James A. FitzPatrick (#03) generating facilities. The Oswego Harbor samples served as control samples while the NMP (#02) and JAF (#03) samples served as indicator samples. All samples were analyzed for gamma emitters. Table 6-2 shows individual results for all the samples in units of pCi/g (wet).

The spring fish collection was made up of thirteen individual samples representing five separate species. Lake trout, white sucker, chinook salmon, smallmouth bass, white perch and brown trout were collected from a combination of the lake sample locations. White sucker, brown trout and lake trout where collected at all three sample locations. The total fall fish collection was comprised of fourteen individual samples representing eight individual species. Brown trout, smallmouth bass, walleye and salmon samples were collected at the indicator sampling locations (NMP and JAF). One sample of each of these species was also collected at the control location (Oswego Harbor).

Cs-137 was detected in three of the eight indicator samples and in one of the five control samples collected during the spring. Indicator samples showed Cs-137 concentrations which ranged from a minimum of 0.024 pCi/g (wet) to a maximum of 0.035 pCi/g (wet). The single control sample Cs-137 concentration was 0.036 pCi/g (wet). The average indicator Cs-137 concentration of 0.028 pCi/g (wet) was slightly less than the single control concentration of 0.036 pCi/g (wet). The indicator results, though lower, are not significantly different from the control results and the measured concentrations of Cs-137 are considered to be representative of background concentrations. The maximum detected Cs-137 concentration in both the indicator and the control location was measured in samples of walleye.

In the fall collection, Cs-137 was detected in six of the fourteen samples collected from both the control (1 of 5) and indicator (5 of 9) locations. Indicator samples showed a mean Cs-137 concentration that was slightly lower than the one positive control sample. The measured concentrations are not significantly different from one another with the indicator mean equal to 0.027 pCi/g (wet) and the single control value equal to 0.030 pCi/g (wet). The Cs-137 concentrations at the indicator locations ranged from 0.018 to 0.035 pCi/g (wet).

The following graph presents the average Cs-137 concentrations for the fish species analyzed for 1993. Walleye samples yielded the highest average Cs-137 concentration for the control locations and chinook salmon yielded the highest Cs-137 concentration for the indicator location.



K-40 was detected in all of the spring samples collected. K-40 is a naturally occurring radionuclide, and is not related to power plant operations. Ra-226, also naturally occurring, was found at varying levels at both the indicator and control locations. No other radionuclides were detected in the spring fish samples.

Naturally occurring K-40 was detected in all of the fall samples collected. Ra-226, also naturally occurring, was detected intermittently at varying concentrations at the indicator and control location samples. No other radionuclides were detected in the fall fish samples.

C. Dose Evaluation

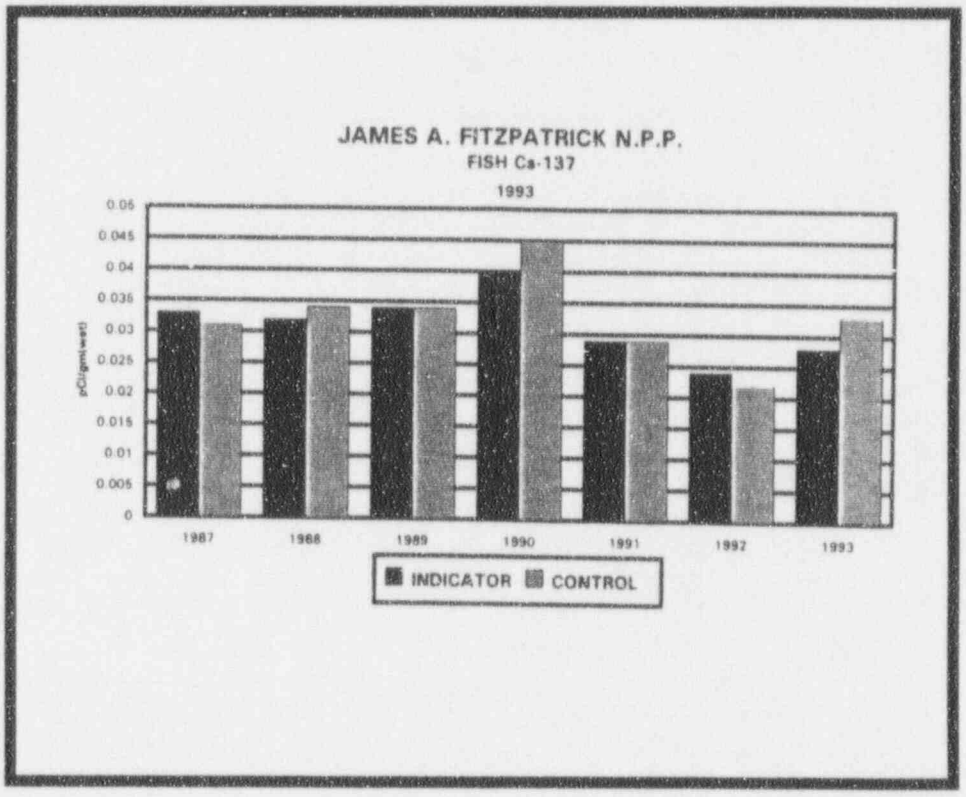
Some Lake Ontario fish species may be considered an important food source due to the local sport fishing industry. Therefore, these fish become an integral part of the human food chain. Based on the importance of fish in the local diet a conservative estimate of potential dose to man can be calculated. Assuming that an adult consumes 21.0 kg of fish per year (Regulatory Guide 1.109 maximum exposed age group) and the fish consumed contains an average Cs-137 concentration of 0.028 pCi/g (wet) (annual mean result of indicator samples for 1993), the whole body dose received would be 0.042 mrem per year. The organ of interest in this case is the liver which would receive a calculated dose of 0.064 mrem per year. The Cs-137 whole body and organ doses are conservative potential doses associated with consuming fish species from the Nine Mile Point area which are represented by the indicator samples. Due to the long half life of Cs-137, no radiological decay is assumed for the calculation of doses.

Conservative whole body and organ doses can be calculated for the consumption of fish from the control location as well. In this case the consumption rate is assumed to remain the same (21.0 kg per year) and the average annual Cs-137 concentration for the control samples is 0.033 pCi/g (wet). The potential calculated Cs-137 whole body dose is 0.049 mrem per year and the associated dose to the liver is 0.076 mrem per year.

In summary, the potential whole body and organ doses observed as a result of consumption of fish is small. The dose to man received from both the indicator and control sample groups are considered to be background exposures. The dose to man from operation of the plants at Nine Mile Point via the fish pathway is of no significance.

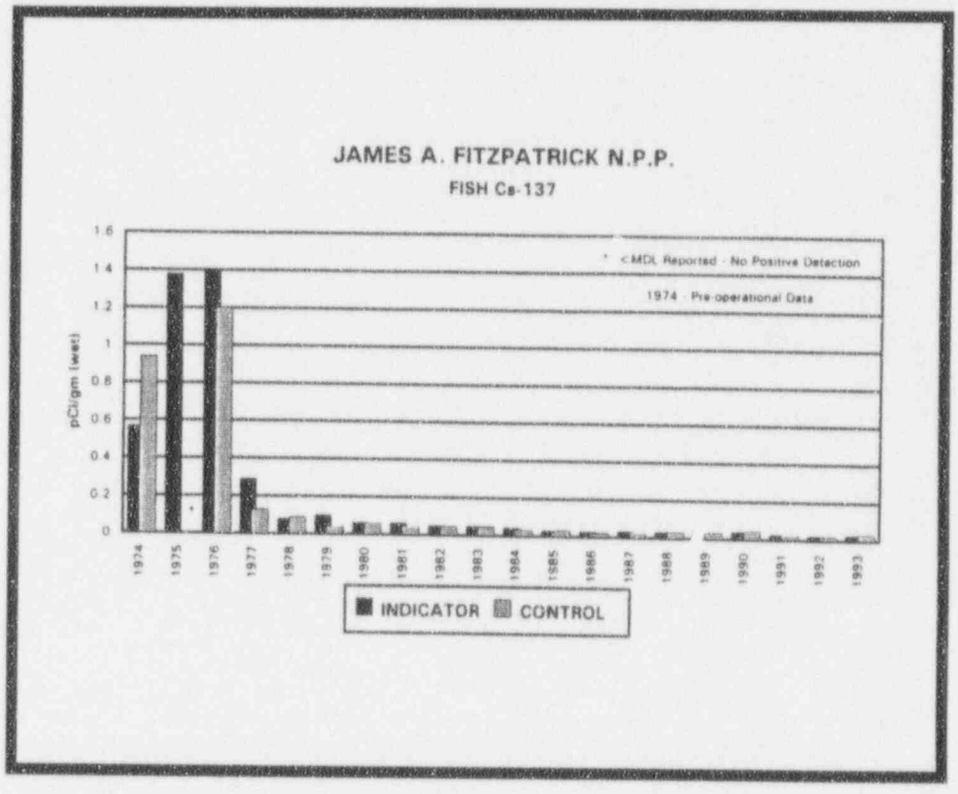
D. Data Trends

Results for the previous five years (1988 through 1992) have shown a consistently stable trend for Cs-137 levels in control and indicator samples. During the period of 1988 through 1992, control and indicator mean results were consistent with a small rise in 1990. The graph below illustrates the mean Cs-137 concentration for 1993 and the previous six years.



The long term trend shows that mean concentrations of Cs-137 for indicator samples has decreased from a maximum concentration of 1.4 pCi/g (wet) in 1976 to a minimum level of 0.024 pCi/g (wet) in 1992. Control sample Cs-137 results have also decreased from a maximum level of 1.2 pCi/g (wet) in 1976 to a minimum level of 0.022 pCi/g (wet) in 1992. The 1993 results were slightly higher than 1992 results.

The general decreasing long term trend for Cs-137, illustrated in the graph below, is most probably a result of the cesium becoming unavailable to the ecosystem due to ion exchange with soils and sediments and radiological decay. The concentrations of Cs-137 detected since 1976 in fish are a result of weapons testing fallout. The general downward trend in concentrations will continue as a function of additional ecological cycling and nuclear decay. There was no apparent effect from the 1986 Chernobyl Nuclear Plant accident during 1986 relative to Cs-137 results in fish samples although an effect may have been detected during the period of 1987 through 1990 since both indicator and control location mean results increased slightly.



The 1993 mean Cs-137 indicator concentration of 0.028 pCi/g (wet) shows a decrease in concentration from 1976 by a factor of 50. Control sample results have decreased from a maximum level of 1.2 pCi/g (wet) in 1976 to a level of 0.033 pCi/g (wet) in 1993. Fish results for the 1993 control samples show a decrease in concentration by a factor of approximately 28 when compared to preoperational data (1974) and by a factor of about 36 compared to 1976.

Tables 7-3 and 7-4 in Section 7.0 show historical environmental sample data for fish. Full size reproductions of the fish result graphs are found in Section 8.0.

5.1.3 SURFACE WATER (LAKE)

A. Results Summary

The Radiological Effluent Technical Specifications (RETS) required that monthly surface water samples be taken from the respective inlet water supply of the James A. FitzPatrick N.P.P. and Niagara Mohawk's Oswego Steam Station. In conjunction with the RETS sample, three additional Lake Ontario surface water locations are sampled and analyzed. These additional locations are the Oswego City Water Intake, the NMP Unit #1 Intake and the NMP Unit #2, Intake. Gamma spectral analysis was performed on 24 monthly composite samples from the RETS locations and on 36 monthly composite samples from the additional sample locations. The results of the gamma spectral analysis show that only two naturally occurring radionuclides were detected in samples from the five locations (60 samples) collected for the 1993 Sampling Program. Both of these radionuclides, K-40 and Ra-226, are naturally occurring, and are not related to operations of the plant. Monthly composite samples show no buildup of gamma emitting isotopes in the waters of Lake Ontario as a result of the operation of the plant.

Quarterly composite samples from the same locations are analyzed for tritium. The 1993 annual mean tritium concentration for the Oswego Steam Station Inlet (control location) was 188 pCi/l with a maximum measured concentration of 230 pCi/l. Annual mean concentration for the JAF inlet which serves as the indicator location, was 242 pCi/l with a maximum measured concentration of 280 pCi/l. Results from the last three years show slightly higher concentrations at the indicator locations relative to the control sample results. Surface water samples demonstrate that there is no measurable radiological impact on the surface waters of Lake Ontario from tritium concentrations. The mean concentration for the indicator and control are within the normal statistical variations for radiological analysis. The levels of tritium are routinely variable within the range of 200 - 500 pCi/l. The tritium results for 1993 are consistent with previously measured lake concentrations and indicate a small decreasing three year trend in tritium levels in the lake in the samples taken at the site.

B. Data Evaluation and Discussion

Gamma spectral analysis was performed on monthly composite samples from five Lake Ontario sampling locations. K-40 and Ra-226 were detected in samples from the five locations over the course of the 1993 sampling program. Both of these radionuclides are naturally occurring and are not plant related.

K-40 was detected consistently in both of the Technical Specification required intake canals. The James A. FitzPatrick inlet canal samples and Oswego Steam Station samples showed K-40 was detected in all twelve monthly samples. Ra-226 was also detected intermittently in both locations required by Technical Specifications and at the other optional sample locations.

Tritium samples are quarterly samples that are a composite of the appropriate monthly samples. Tritium was detected in each of the eight samples taken at the two locations required by Technical Specifications. Tritium concentrations for the James A. FitzPatrick inlet canal ranged from 200 pCi/liter to 280 pCi/liter and showed a mean concentration of 242 pCi/liter. The Technical Specification control location (Oswego Steam Station inlet canal) showed tritium results which ranged from 160 pCi/liter to 230 pCi/liter.

Tritium was also detected in each of the twelve optional samples taken. The tritium results ranged from 160 pCi/liter to 330 pCi/liter for the optional samples taken. The maximum tritium concentration of 330 pCi/l was measured in the third quarter Nine Mile Point Unit 2 inlet sample.

Samples collected from the Oswego City water supply exhibit tritium concentrations in the range of 180 pCi/l to 230 pCi/l with a mean concentration of 212 pCi/l.

A summary of tritium results for the 1993 sample program is listed below:

Sample Location	Tritium Concentration pCi/liter Minimum	Maximum	Mean (Annual)
JAF Inlet	200	280	242
Oswego Steam Inlet	160	230	188
NMP #1 Inlet	160	320	212
NMP #2 Inlet	200	330	242
City Water Intake	180	230	212

C. Dose Evaluation

The Oswego Steam Station is considered a control location because of its distance from the site and the influence of lake current patterns and current patterns from the Oswego River located nearby. The current patterns distinguish the Oswego Steam Station intake and the near by Oswego City water intake as an "up-current" sampling point and the JAFNPP inlet canal as a "down-current" sampling point. The Nine Mile Point Site is located such that it does not have a radiological impact on Oswego drinking water supply. The Oswego City water intake is located west of the Oswego Steam Station inlet placing it upstream from the Nine Mile Point Site. The tritium concentrations measured in these upstream or control locations are representative of background levels present in Lake Ontario.

The impact of background levels of tritium in water to members of the public is minimal. This can be evaluated by calculating a dose to the whole body and maximum organ. Using Regulatory Guide 1.109 methodology, ingestion of water (510 l/yr) at the indicator location (242 pCi/l) would result in a dose of 0.025 mrem to the whole body and 0.025 mrem to the child liver. The doses at the control locations were 0.019 mrem whole body and 0.019 mrem to the child liver. Drinking water sampled in Oswego is drawn from Lake Ontario at a location more distant than the control location. Doses from tritium at this

location were 0.022 mrem to the whole body and 0.022 mrem to the child liver. Doses received as a result of water ingestion are approximately the same. The theoretical dose received from the indicator location was slightly higher, although well within natural variability. Doses from all water sampled are considered background doses and are negligible.

D. Data Trends

There are no data trends for gamma emitters such as Cs-137 and Co-60 as historically these radionuclides are not detected in lake water samples.

Tritium results for the 1993 lake water samples were consistent with results from the previous five years for both the indicator and control locations. During the five year period the maximum indicator and control concentration were measured in 1988. The mean tritium concentrations for the period of 1988 - 1992 range from 186 pCi/l to 320 pCi/l for the control and 225 pCi/l to 460 pCi/l for the indicator location. The mean 1993 tritium concentrations for the control and indicator locations were 188 pCi/l and 242 pCi/l respectively.

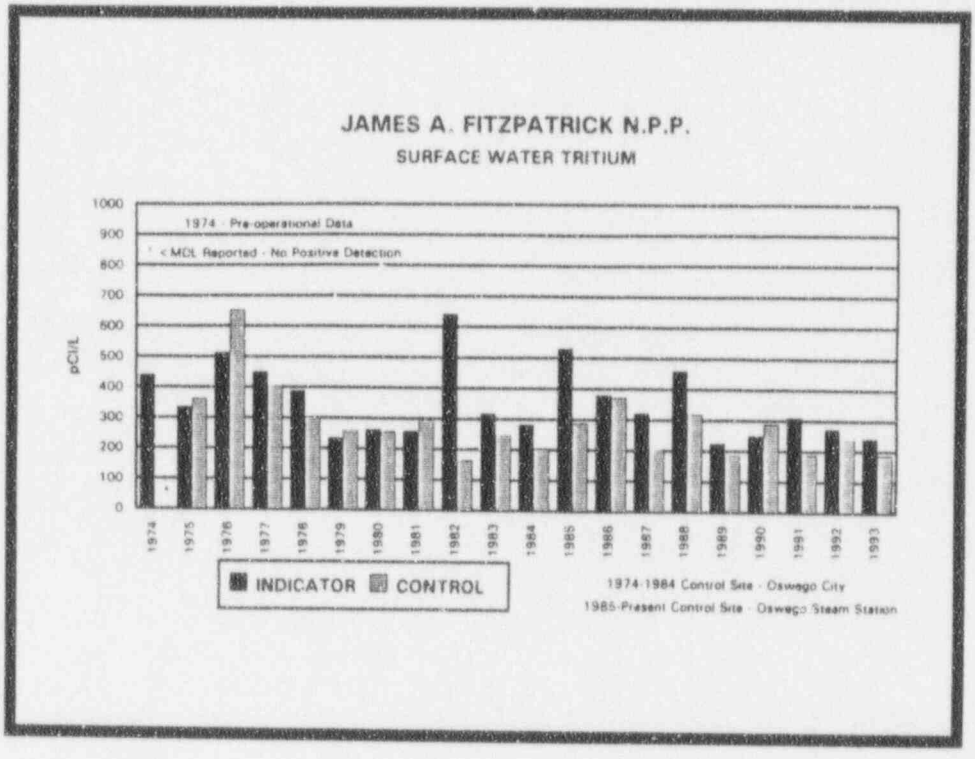
The 1993 indicator results are slightly lower than the previous two years and approximately one half of the mean concentration for 1988. The 1993 data is consistent with concentrations measured since 1989.

Mean tritium results of the control location (Oswego Steam Station) cannot be evaluated with regard to long term historical data since sampling was only initiated at this location in 1985.

Some idea of the variability of historical control sample data can be obtained by a review of previous data from the City of Oswego drinking water samples. These drinking water samples are likely to be representative of the current control location because of the effects of the distance, predominate lake currents, and the discharge of the Oswego River. The Oswego City water intake is located in the same vicinity as the Oswego Steam Station inlet though offshore. The maximum annual

mean concentration of city water was found in 1976 (652 pCi/l) and the minimum in 1982 (165 pCi/l).

The following graph illustrates the concentrations of tritium measured in Lake Ontario over the past 18 years at both an indicator and control location.



Annual mean tritium results from previous city water samples from 1976 to 1993 show that the tritium concentrations have fluctuated over the years. The maximum annual mean concentration was found in 1976 (652 pCi/liter) and the minimum in 1982 (165 pCi/liter). Results for the period of 1982 through 1989 shows that the indicator samples were higher than the control samples. This trend reversed itself in 1990 and returned in 1991 through 1993.

5.2 TERRESTRIAL PROGRAM

The terrestrial program consists of samples from four environmental pathways. These pathways are:

- o Airborne particulate and radioiodine
- o Direct radiation
- o Milk
- o Food Products

Tables 6-5 through 6-14 represent the analytical results for the terrestrial samples collected for the 1993 reporting period.

5.2.1 AIR PARTICULATE GROSS BETA

A. Results Summary

Weekly, air samples were collected and analyzed for gross beta particulate activity. A total of 53 samples were collected from the control location R-5 and 212 samples were collected from the indicator locations R-1, R-2, R-3 and R-4 during 1993. These five locations are required by the Technical Specifications. Additional air sampling locations are maintained and discussed under Section 5.2.1.B below. The mean concentration of the control location, R-5, was 0.013 pCi/m^3 for 1993. The mean concentration for the indicator locations was 0.014 pCi/m^3 for 1993. The indicator and control results are essentially equal and show that there are no increased airborne radioactivity levels in the general vicinity of the site. These results are the second lowest mean gross beta concentration measure to date since the inception of the site Environmental Monitoring Program in 1969. The consistency of these low concentrations over the past four years may indicate that the natural base line gross beta activity has been reached. It is possible that the manmade radionuclide contribution to the natural background from weapons testing can no longer be detected above the background concentrations for naturally occurring beta emitting radionuclides.

B. Data Evaluation and Discussion

Ten air sampling locations are maintained in addition to those required by the Technical Specifications. A total of six on-site and nine off-site locations were sampled weekly for gross beta particulate activity. A total of 780 analyses were performed. Five of the nine off-site locations are required by Technical Specifications. These locations are R-1, R-2, R-3, R-4 and R-5. R-5 is a control location required by the Technical Specifications and is located beyond any local influence from the site. In addition, optional off-site and on-site air sample locations are maintained from which weekly samples are collected. The optional off-site locations are designated as D-2, E, F, and G. The optional on-site locations are designated as D-1, G, H, I, J and K.

Gross beta analysis requires that the samples are counted no sooner than 24 hours after collection. This allows for the decay of short half-life naturally occurring radionuclides and there by increasing the sensitivity of the analysis for plant related radionuclides.

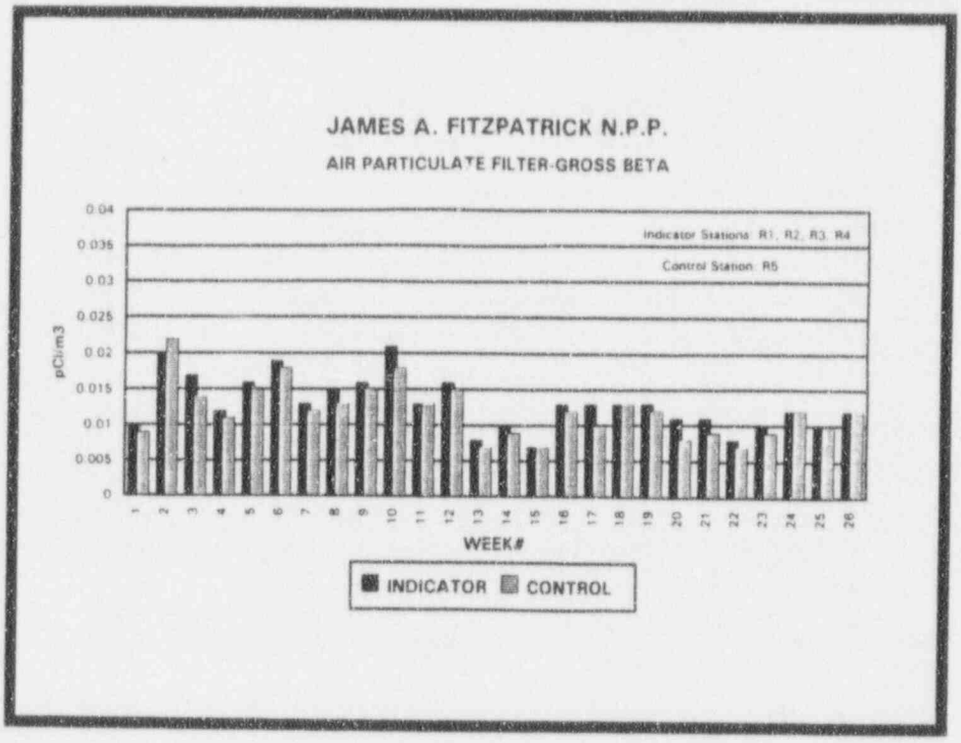
Tables 6-5 and 6-6 in Section 6.0 present the weekly gross beta activity results for the off-site and on-site stations.

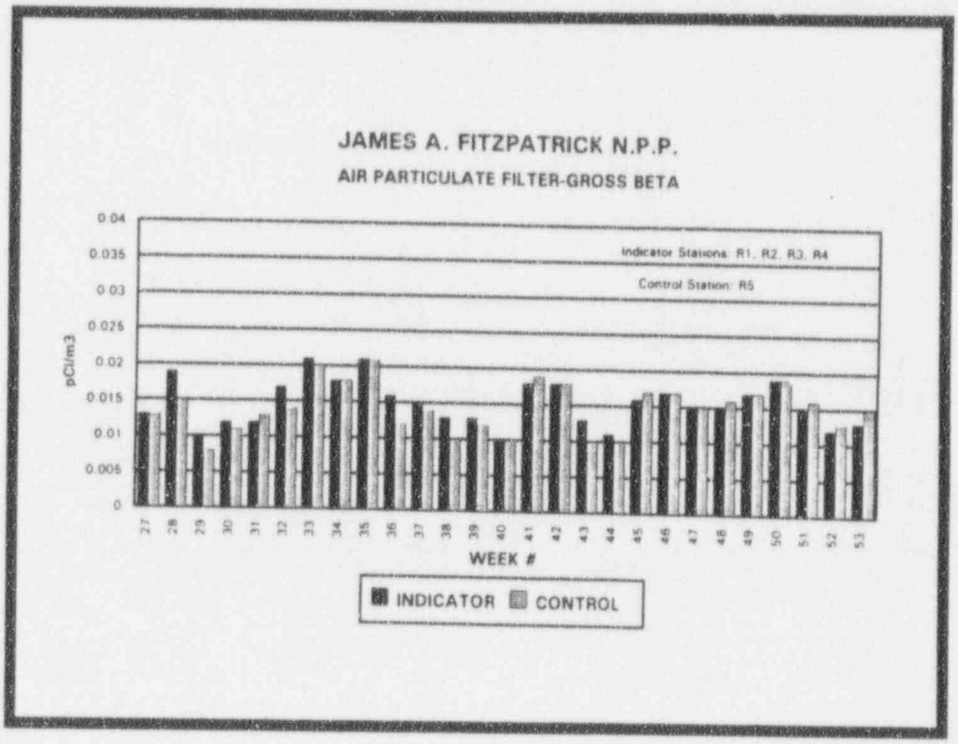
The average yearly gross beta indicator concentration for the indicator stations (R-1, R-2, R-3 and R-4) in 1993 was 0.014 pCi/m^3. The average yearly gross beta control concentration for the off-site station (R-5) was 0.013 pCi/m^3. The minimum, maximum and average gross beta results for sample locations required by Technical Specifications were:

	pCi/m^3		
Location*	Minimum	Maximum	Average
R-1	0.007	0.021	0.014
R-2	0.006	0.023	0.015
R-3	0.005	0.025	0.014
R-4	0.007	0.021	0.014
R-5 (control)	0.007	0.022	0.013

* Locations required by the Technical Specifications

The mean weekly gross beta concentrations measured in 1993 are illustrated in the graphs below.





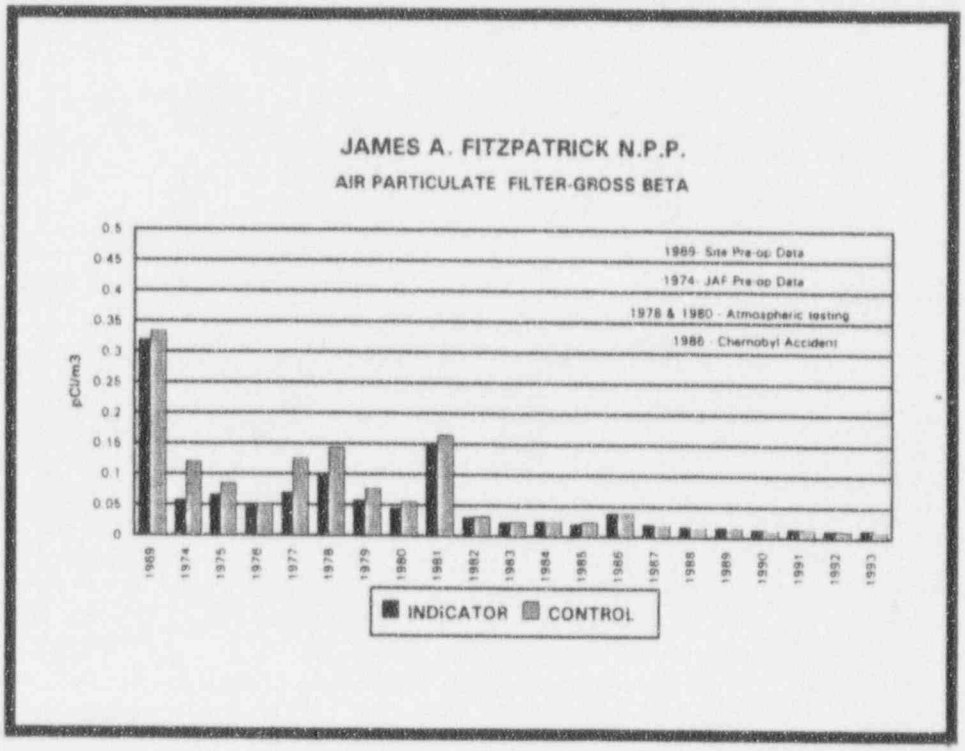
The small fluctuations observed in the gross beta activity over the year can be attributed to changes in the environment, especially seasonal changes. The concentration of naturally occurring radionuclides in the lower levels of the atmosphere directly above land are affected by time related processes such as wind direction, precipitation, snow cover, soil temperature and soil moisture content.

C. Dose Evaluation

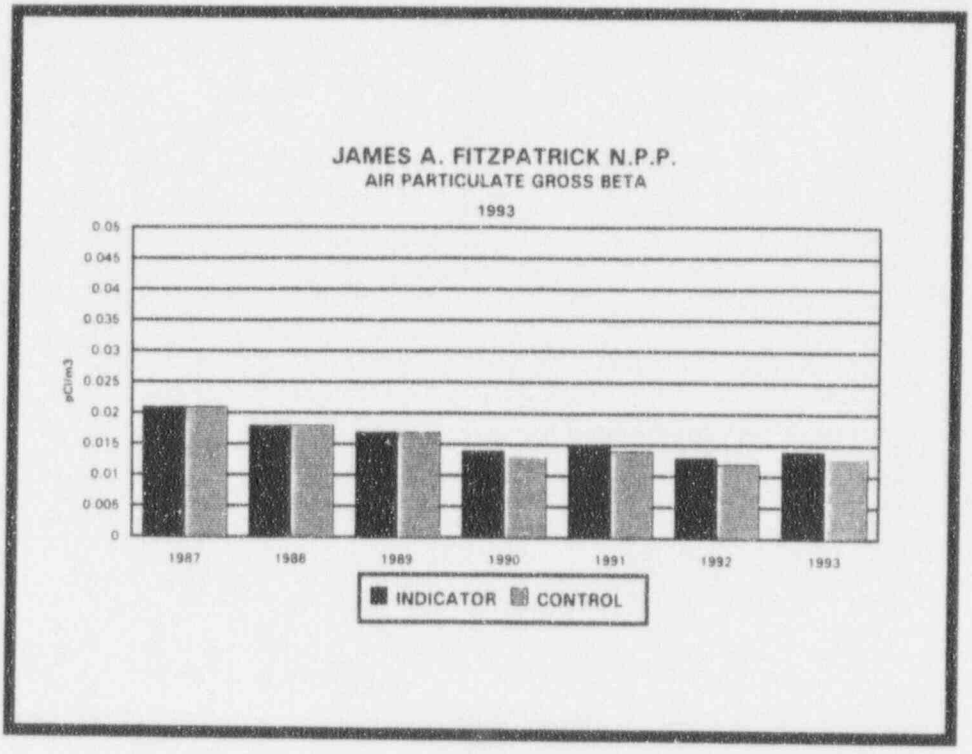
Dose calculations are not performed based on gross beta concentrations. Dose to man as a result of radioactivity in air is calculated using the specific radionuclide and the associated dose factor. See Section 5.2.2.C for dose calculations from air concentrations.

D. Data Trends

With the exception of the 1986 sample data, which was effected by the Chernobyl accident, the general trend in air particulate gross beta activity has been one of decreasing activity since 1981.



The trend for the previous five years is a subset of the overall decline in gross beta concentrations, again with the exception of 1986 when a one year increase was measured as a result of the Chernobyl accident. The 1993 results are second lowest mean concentrations measured when compared to the previous five years for both the indicator and control locations. The change in concentration from the 1991 values is very small. This is illustrated by the following graph.



The air particulate gross beta indicator results for 1993 are a factor of 23 less than the concentrations measured in 1969. 1969 concentrations are considered to be preoperational results for the site. For the operational period of 1975 - 1993 the mean annual gross beta concentration at the control station (R-5) has decreased from a maximum concentration of 0.165 pCi/m^3 in 1981 to a minimum of 0.012 pCi/m^3 in 1992. The mean annual concentration for the indicator stations for this same time period ranged from a maximum of 0.151 pCi/m^3 in 1981 to a minimum of 0.013 pCi/m^3 in 1992. For both the indicator stations and control stations, the gross beta concentration during 1974 to 1982 fluctuated as a result of fallout from the detonation of thermonuclear weapons. The mean annual results for the years 1983,

1984, 1985, 1987 and 1988 from both the indicator and control locations have been similar and ranged from 0.018 to 0.026 pCi/m^3. This level of activity appears to be at or near baseline range. The 1986 annual mean result was 0.039 pCi/m^3 for both the indicator and control stations. This concentration is slightly higher than 1983-1985 and 1987-1992 levels, and is attributed to fallout from the Chernobyl accident.

Historical data and graphic representations of air particulate gross beta activity are presented in Sections 7.0 and 8.0 respectively.

5.2.2 MONTHLY PARTICULATE COMPOSITES (GAMMA EMITTERS)

A. Results Summary

No plant related radionuclides were detected in any of the air particulate filter samples collected from the Technical Specifications required sampling locations. These stations are located near the site boundary and off-site.

The gamma analysis results for the monthly composite samples routinely showed positive detections of Be-7, K-40, Ra-226, and AcTh-228. Each of these radionuclides is naturally occurring.

Be-7 was detected in all the monthly composite samples for the indicator and control locations. K-40, Ru-226 and AcTh were found intermittently in the monthly composite samples from all locations.

B. Data Evaluation Discussion

Ten additional air sampling locations are maintained in addition to the five required by Technical Specifications. Each of the fifteen weekly air particulate samples were assembled by location to form monthly composite samples. The monthly composite samples required by Technical Specifications are R-1, R-2, R-3, R-4, and R-5. Other sample locations not required by the Technical Specifications for which analytical results have been provided include six on-site locations and four off-site locations. The results of all monthly composite samples are presented in Section 6.0, Table 6-9.

Two plant related radionuclides were detected in one of the additional on-site air sample location composite samples. Analytical results of the H on-site air particulate filter for week 24 (06/07/93) showed an elevated gross beta concentration of 0.046 pCi/m^3. Subsequent gamma spectral analysis detected the presence of small concentrations of Co-60 (3.75E-2 pCi/m^3) and Zn-65 (1.38E-1 pCi/m^3). The measured concentrations are very small (<1.0 pCi/m^3) and no procedural or regulatory limits were exceeded. There was no measurable dose to the

general public as these radionuclides were measured at an on-site sample station. Sample results from environmental stations located at the site boundary in the same general direction showed no elevated gross beta concentration for this same sample period. An assessment of the operational and environmental conditions demonstrate that the presence of the Co-60 and Zn-65 in the air particulate sample was the result of dust loading on the sample filter. The dust contained activity which was previously deposited in the ground. The soil was put into suspension by the winds and site construction activities during the sample period. The measured activity was not the result of plant operation during the sample period. The total maximum dose from the measured concentrations would be 2.02E-4 mrem to the critical individual whole body and 7.73E-3 mrem to the lung.

C. Dose Evaluation

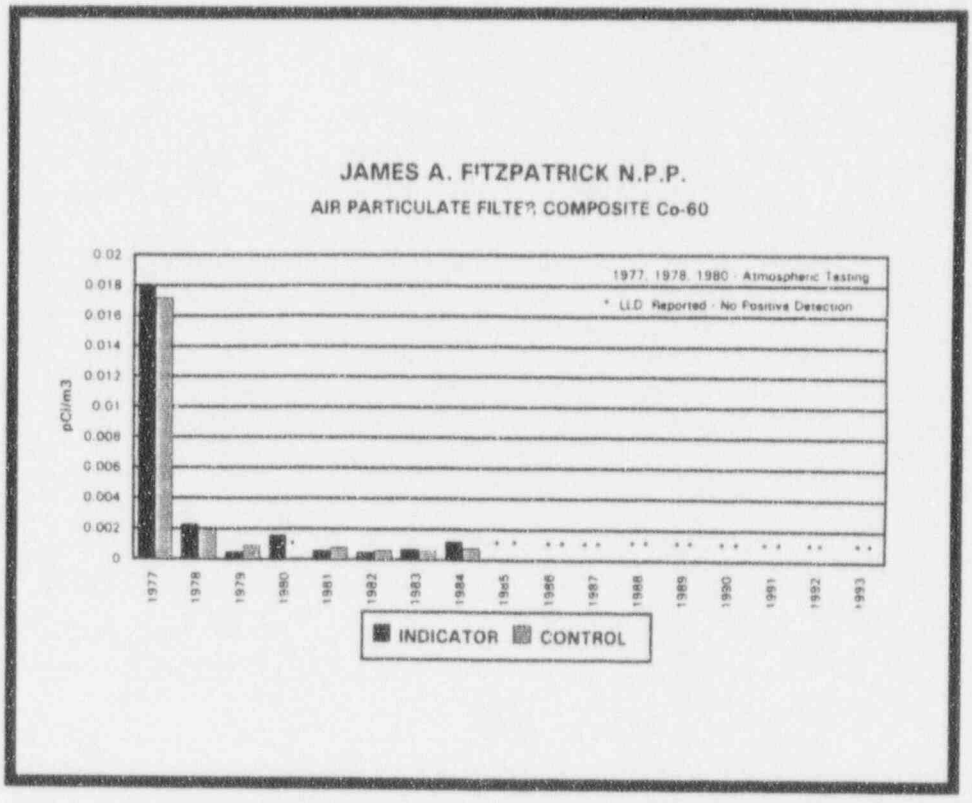
The air particulate sampling program showed no off-site dose to man from this pathway as a result of operations of the plant. No plant related radionuclides were detected at any of the sampling locations located at or beyond the site boundary.

D. Data Trends

No plant related radionuclides were detected during 1993 at the off-site air monitoring locations. As noted above, two plant related radionuclides were detected at one on-site station.

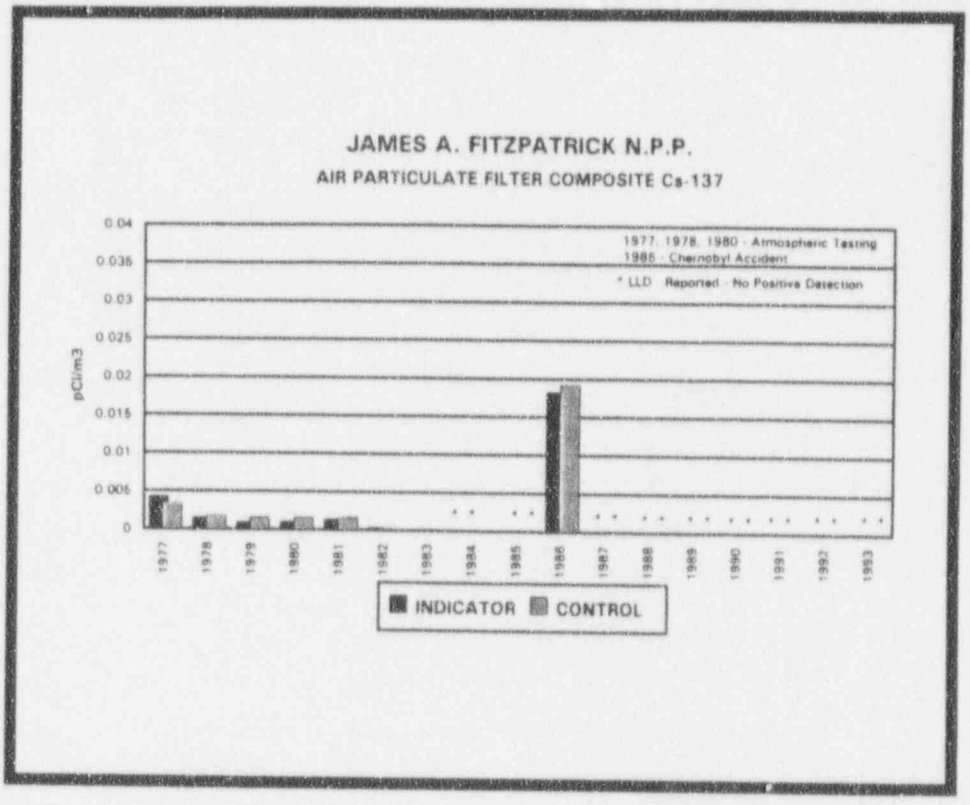
Co-60 was detected in each of the years from 1977 through 1984 at both the indicator and control locations with the exception of 1980 when Co-60 was not detected at the control location. The presence of Co-60 in the air samples collected during these years was the result of atmospheric weapons testing. The maximum yearly mean concentration detected during this period was in 1977 when the mean indicator results was 0.0179 pCi/m^3. The mean control value for this same year was 0.0172 pCi/m^3. The Co-60 in the air particulate samples trended downward during the 1977 through 1984 period to a low mean

concentration of 0.0008 pCi/m^3 at the control location. Co-60 has not been detected in any of the required air particulate samples since 1985. This general downward trend and eventual elimination of Co-60 in the air samples is illustrated in the following graph.



Historical data shows that Cs-137 is the fission product radionuclide most frequently detected in the air particulate filter composites. Cs-137 was detected in each of the years from 1977 through 1983 at both the control and indicator sampling locations. The maximum concentration for this period were measured in 1977 with a mean indicator concentration of 0.0043 pCi/m^3 and the corresponding control concentration of 0.0034 pCi/m^3. After 1977, the Cs-137 concentration showed a reduction by a factor of approximately two and remained constant through 1981. In 1982, a second reduction in Cs-137 concentration was measured followed by a further reduction in concentration in 1983. Cs-137 was not detected during 1984 and 1985 in any of the indicator or control air particulate composite samples.

For the period, 1986 to 1991, Cs-137 was detected only in 1986 due to the fallout from the Chernobyl accident. The 1986 mean concentration of Cs-137 for the control location was 0.0193 pCi/m^3. The mean concentration of Cs-137 for the indicator location was 0.0183 pCi/m^3 for the sample period. This overall reduction in Cs-137 results since 1977 is attributed to nuclear decay and ecological cycling of Cs-137 initially produced as a result of weapons testing. The decrease in air particulate Cs-137 concentrations since 1977 is clearly illustrated on the graph of historical data.



In 1986, in addition to Cs-137, Zr-95, Ce-141, Nb-95, I-131, Ce-144, Mn-54, Ru-103, Ru-106, Ba-140. These isotopes were detected in air particulate composite samples as a result of the fallout from the Chernobyl accident. After 1986, no plant related or fallout radionuclides were detected in any of the off-site air particulate composite samples. A review of the past five years data for air particulate filter composites indicate no plant related radiological impact on the environment. All the historical positive detections of fission product radionuclides were associated with atmospheric weapons testing or the Chernobyl accident.

Current air particulate filter composite results can not be compared to preoperational data as none exists prior to 1977.

Historical data for air particulate results are presented in Section 7.0, Tables 7-11 and 7-12. Full size graphic representation of air particulate composite Co-60 and Cs-137 concentrations are presented in Section 8.0.

5.2.3 AIRBORNE RADIOIODINE (I-131)

A. Results Summary

Iodine I-131 was not detected in any of the 795 samples analyzed for the 1993 program. No radioiodine has been detected off-site since 1986 when measurable levels of I-131 were found as a result of fallout from the Chernobyl accident.

B. Data Evaluation and Discussion

Airborne radioiodine is monitored at the fifteen air sampling stations used to collect air particulate samples. There are nine off-site locations, five of which are required by Technical Specifications. The off-site locations required by Technical Specifications are designated as R-1, R-2, R-3, R-4 and R-5. R-5 is a control station located beyond any local influence from the plant. Ten air sampling locations are maintained in addition to those required by Technical Specifications. Six of these stations, D-1, G, H, I, J and K, are located on-site. D-2, E, F and G are the optional stations located off-site.

Samples are collected using activated charcoal cartridges. They are analyzed weekly for I-131. The analytical data for radioiodine are presented in Section 6.0, Table 6-7 and 6-8.

C. Dose Evaluation

The I-131 airborne sampling program showed no impact due to the operation of the plant. No radioiodine was detected in any sampling location.

D. Data Trends

No radioiodine has been detected at air sampling locations required by Technical Specifications since 1987.

The prior five year I-131 data shows no environmental impact or trend due to plant operations during the period from 1988 through 1992. I-131 was detected twice over the last five year period, in 1986 and 1987. The 1986 detection was the result of the Chernobyl accident and the 1987 detection was the result of plant operations.

Iodine - 131 (I-131) has been detected in the past at control locations. During 1976, the mean off-site I-131 concentration averaged 0.604 pCi/m^3. 1977 showed an I-131 concentration that decreased to 0.323 pCi/m^3 and for 1978 the concentration decreased by a factor of ten to 0.032 pCi/m^3. During 1979 - 1981 and 1983 - 1985, I-131 was not detected at the control locations. I-131 was detected once at the control location during 1982 at a concentration of 0.039 pCi/m^3. I-131 was detected at the on-site locations in 1980 through 1983, 1986 and 1987. The mean concentrations ranged from 0.013 pCi/m^3 in 1980 to 0.119 pCi/m^3 in 1986. The maximum I-131 concentration of 0.119 pCi/m^3 was the result of the Chernobyl accident. I-131 was detected in a total of 75 weekly samples collected during the 1986 sample program. The concentrations detected in 1986 ranged from a minimum of 0.011 pCi/m^3 to a maximum of 0.36 pCi/m^3. Each of the positive detections of I-131 in 1986 were a direct result of the Chernobyl Nuclear accident.

Preoperational data for I-131 in air is limited. Results from 1974 showed no positive measurement of I-131. Current data which showed no measured concentrations of I-131 is consistent with the 1969 and 1974 preoperational data.

A graphic presentation of airborne radioiodine is presented in Section 8.0.

5.2.4 DIRECT RADIATION (THERMOLUMINESCENT DOSIMETERS (TLD))

A. Results Summary

71 TLD locations are used to measure direct radiation levels in the environment. The dosimeters are collected and read each quarter. The 1993 results are consistent with those observed in 1992 and previous years. TLD results are evaluated by organizing the locations into five logical groups by geographic location relative to the site. The five logical groups are on-site, site boundary, off-site, special interest and controls. A summary of the measured exposure in each group are as follows:

	Dose in mrem per standard month		
Group	Minimum	Maximum	Mean
On-site indicators	3.1	13.6	5.2
Site boundary	3.3	11.7	5.4
Off-site indicators	3.2	5.7	4.3
Special interest	3.2	5.1	4.2
Controls	3.4	5.7	4.4

* Location required by Technical Specifications

The highest dose was measured at an on-site location. The location is in the ENE sector between the FitzPatrick plant and the NMP Unit #2 Facility. This TLD is influenced by turbine shine from the two plants. The site boundary maximum dose was 11.7 mrem per standard month. This TLD is located in the WNW sector along the lake shore and is in close proximity to the NMP Unit #1 plant. The TLD locations along the lake shore close to the plants are influenced by the rad waste building and rad waste shipping activities. These environmental dose are not representative of doses measured at the remaining site boundary location. The remaining TLD locations which are located away from the plant are comparable to levels measured at the control locations.

Overall, environmental direct radiation measurement results for 1993 showed no indication of increased direct radiation at or beyond the site boundary resulting from operations at the site.

B. Data Evaluation and Discussion

Thermoluminescent dosimeters (TLDs) are used to measure direct radiation (gamma dose) in the environment. Badges are obtained from Teledyne Isotopes quarterly and read at the Teledyne Isotopes facility in Westwood, New Jersey.

71 environmental TLDs were collected and read on a quarterly basis during the sample year. The location results are an average of eight independent readings per quarter at each location and are reported in mrem per standard month (See Section 6.0, Table 6-10).

During 1993, collections were made during the weeks of March 29, June 28, September 27, and December 27. Most of the locations required by the Technical Specifications during 1993 were initiated in 1985 as a result of the issuance of new Technical Specifications by the NRC. Therefore, 1993 results can only be compared to 1985 - 1992 results. Some locations including a number required by the Technical Specifications (i.e., numbers 7, 14, 15, 18, 23, 49, 56, and 58) can be compared to earlier results since these TLDs were established prior to 1985.

On-site TLDs are located at special interest areas within the site boundary. With the exception of location numbers 7 and 23, these locations are not required by the Technical Specifications. Locations 7 and 23 are located near the generating facilities at previous or existing on-site air sampling stations and are used to evaluate sectors that do not extend beyond the site boundary. TLDs located at the environmental monitoring stations include numbers 3, 4, 5, 6, 7, 23, 24, 25 and 26. The results for these locations are very consistent with the previous year results. These results ranged from 3.1 to 13.6 mrem per standard month.

Other on-site special interest TLDs are located near the north shoreline of the Nine Mile Point Unit 1, Unit 2 and JAF facilities. They are in close proximity to radwaste facilities and the Unit 1 reactor building. These locations include numbers 27, 28, 29, 30, 31, 39 and 47. Results for these TLDs during 1993 were widely variable and ranged from 5.3 to 33.7 mrem per standard month as a result of activities at the radwaste facilities and the operating modes of the generating facilities. Results for 1993 are consistent with the ranges of variability noted in 1992 for measurements at or near these locations.

Additional on-site TLD locations are located near the on-site Energy Center and the associated northeast shoreline. These locations include numbers 18, 103, 106 and 107. TLDs 103, 106, and 107 are located east of the Energy Center and west of the Unit 1 facility. TLD number 18 is located on the west side of the Energy Center. Results for this group ranged from 3.9 - 6.0 mrem per standard month for 1993 and were consistent with the 1992 results.

The Technical Specification required site boundary TLDs are located in the approximate area of the site boundary, one in each of the sixteen 22 1/2 degree meteorological sectors. These include numbers 7, 18, 23, and 75 - 87. Location numbers 7, 18 and 78 - 84 showed results that were consistent with control TLD results and ranged from 3.3 to 6.0 mrem per standard month. These site boundary TLDs during 1993 were consistent with 1985-1992 results. TLD numbers 23, 75, 76, 77, 85, 86 and 87 showed results that ranged up to approximately three times the control results. These site boundary results ranged from 3.3 to 11.7 mrem per standard month. This subset of site boundary TLDs are located near the lake shoreline (approximately 100 feet from the shoreline), in close proximity to the reactor building and radwaste facilities of NMPNS Unit 1 and Unit 2 and the radwaste area of the JAF facility.

An estimate of the net site boundary dose can be made using available TLD results. Measured results from TLDs located near the site boundary in sectors facing the land occupied by members of the public

(excluding TLDs near the generating facilities and facing Lake Ontario) can be compared to control location results. The site boundary locations include numbers 7, 18, 78, 79, 80, 81, 82, 83 and 84. Site boundary TLD numbers 75, 76, 77, 23, 85, 86 and 87 were excluded from the net site boundary dose calculation. These areas are near the north shoreline close to the generating facilities and are not representative of dose rates for members of the public. Control locations include numbers 8, 14, 49, 111 and 113. Net site boundary doses for each quarter in mrem per standard month are as follows:

Quarter	Site Boundary*	Control*	Net Site Boundary Dose*
1	3.8	4.2	-0.4
2	4.0	4.0	+0.0
3	5.3	5.2	+0.2
4	4.2	4.2	+0.0

*Dose in mrem per standard month

The third group of environmental TLDs are located four to five miles from the site in each of the eight land based 22.5 degree meteorological sectors. These locations are required by the Technical Specifications. At this distance, badges are not present in eight of the sixteen meteorological sectors which are located over Lake Ontario.

Results for this group of TLDs during 1993 represented a range of 3.4 to 6.3 mrem per standard month. The range of results is caused by differences in naturally occurring physical conditions and the varying concentrations of naturally occurring radionuclides in the ground at each of the locations. These results are consistent with control TLD results during 1993 and with the 1986 - 1992 results. Results were also congruous with other off-site TLD results during 1992 and previous to 1992. These TLDs were established in 1985 and include numbers 88, 89, 90, 91, 92, 93, 94 and 95.

The fourth group of environmental TLDs are located near the site boundary and at special interest areas. Industrial sites, schools, nearby communities, towns, off-site air sampling stations, the closest residence to the site, and the off-site environmental laboratory are included as special interest locations. Many of these TLDs are required by the Technical Specifications. Others are optional. This group of locations include numbers 9, 10, 11, 12, 13, 15, 19, 51, 52, 53, 54, 55, 56, 58, 96, 97, 98, 99, 100, 101, 102, 108 and 109. TLD numbers 108 and 109 are new locations that were established during 1988 and were added to assist in the evaluation of the residence TLD locations. In 1993 results ranged from 3.2 to 5.9 mrem per standard month. All of the TLD results from this group were within the general variation of the control TLDs. Results during 1993 were consistent with results noted for previous years.

The fifth category of TLDs are those used to measure the dose rate at the control locations. These TLDs are required by the Technical Specifications and include numbers 14 and 49. Optional control locations are numbers 8, 111 and 113. Location number 111 was added to the program during 1988 to expand the data base for control measurements. Results for all control locations from 1993 ranged from 3.4 to 5.7 mrem per standard month. Results from 1993 were consistent with previous years results.

C. Dose Evaluation

TLDs located at the site boundary averaged 4.3 mrem per standard month (No. 7, 18, 78, 79, 80, 81, 82 83, 84).

TLDs placed at the special interest locations averaged 4.3 mrem per standard month.

The control TLD results averaged 4.4 mrem per standard month in 1993 (No. 8, 14, 49, 111, 113).

The measured mean dose in the proximity of the closed resident was 4.5 mrem per standard month (No. 108 and 109) which is consistent with the control measurements.

The mean dose for each of the geographic location categories demonstrates that there is no statistical difference in the annual dose as a function of distance from the site. The TLD program verifies that operations at the site do not measurably contribute to the levels of direct radiation present in the off-site environment.

D. Data Trends

A comparison of historical results for TLD results can be made using the different categories of measurement locations. These include site boundary TLDs in each meteorological sector (16 locations), TLDs located off-site in each land based sector at a distance of four to five miles (8 locations), badges located at special interest areas (6 locations) and TLDs located at control locations (4 locations). As noted previously, many of the present TLD locations became effective in 1985 and these results can only be evaluated for 1985 - 1992.

TLDs located at the site boundary averaged 6.1 mrem per standard month during 1987. During 1988, 1989, 1990, 1991 1992 and 1993 site boundary dose rates averaged 5.4, 4.8, 4.8, 4.8, 4.2 and 4.3 mrem per standard month respectively. As noted previously, this group of TLDs can fluctuate because several of these TLDs are located in close proximity to the generating facilities and influenced by operational modes. An increase was noted during 1986 although such an increase was noted for all TLDs including the control locations. During 1993, site boundary measurements averaged 5.4 mrem per standard month which is lower than the mean for the last five years and consistent with 1992.

TLDs located off-site at a distance of four to five miles from the site in each of the land based meteorological sectors (off-site sectors) averaged 5.2 mrem per standard month during 1987. During 1988, 1989, 1990, 1991 and 1992 off-site sector dose rates averaged 5.3, 4.9, 4.7, 4.7 and 4.1 mrem per standard month, respectively. Results for the group averaged 5.0 mrem standard month over the five year period. The 1993 mean dose of 4.4 mrem per standard month is consistent with the previous five year mean and each individual yearly mean.

Special interest locations averaged 5.3 mrem per standard month during 1988. During 1987 these same locations averaged 5.1 mrem. 1989, 1990, 1991 and 1992 results averaged 4.9, 4.8, 4.4 and 4.1 mrem per standard month respectively. The 1993 results for these locations averaged 4.5 mrem per standard month which is consistent with the previous five year average of 4.7 mrem per standard month.

The final group of TLD locations required by the Technical Specifications is the control group. This group (No. 8, 14, 49, 111 and 113) utilizes locations positioned well beyond the site. Results from 1986 for the control group averaged 6.3 mrem per standard month. During 1987, this same group of TLDs averaged 5.4 mrem per standard month. A marked increase was noted in the second quarter of 1986. The increase may have been a result of the Chernobyl accident. Results for 1988, 1989, 1990, 1991 and 1992 averaged 5.6, 4.7, 4.7, 4.7 and 4.4 mrem per standard month respectively. Results for 1993 averaged 4.4 mrem per standard month.

The 1993 TLD program results, when compared to the previous five years and preoperational data, shows no significant trends relative to increased dose rates in the environment.

Tables 7-15 and 7-16 show the historical environmental sample data for environmental TLDs. A graph of historical TLD data is presented in Section 8.0.

5.2.5 MILK

A. Results Summary

A total of 72 milk samples were collected and analyzed for the 1993 sample program. Each sample was analyzed for radionuclides using gamma spectroscopy and iodine extraction procedures. There were no plant related radionuclides detected in the indicator or control milk samples collected and analyzed. Naturally occurring K-40 was detected in both indicator and control samples at levels consistent with past years results.

B. Data Evaluation and Discussion

Milk samples were collected from five indicator and one control location. Technical Specifications require that three sample locations are within five miles of the site. Based on the milk animal census there were no adequate milk sample locations within five miles of the site in 1993. Samples were collected from six farms located beyond the five mile requirement to ensure the monitoring of this important pathway. The five indicator locations ranged from 5.5 to 9.5 miles from the site. The control samples were collected from a farm 17 miles from the site and in a low frequency wind sector (upwind). The control sampling location, No. 65 ceased milking operations in August 1993. The milk herd was sold and samples were no longer available. A new control location, No. 73 was initiated in the second half of August 1994. The new control location is in the same relative location as the previous control. With the exception of the new control location, the reported locations have been sampled since 1989. The geographical location of each location is listed below:

Location No.	Direction From Site	Direction (Miles)
7	ESE	5 5
50	E	8.2
55	E	9.0
60	E	9.5
4	ESE	7.8
65 Control	SW	17.0
73 Control (8/16/93)	SW	13.9

Samples were collected at locations 7, 50, 55, 60, 4 and 65/73 from April through December, during the first and second half of each month. Because I-131 was not detected in samples collected during November and December of 1992, no additional samples were required for January through March of 1993.

Each sample is analyzed for gamma emitters using a gamma spectral analysis. The I-131 analysis is performed using resin extraction followed by spectral analysis for each sample. I-131 analytical results are provided in Section 6.0, Table 6-11. Sample analysis results for gamma emitters are provided in Section 6.0, Table 6-12.

Iodine-131 was not detected in any indicator or control samples analyzed during 1993. All I-131 milk results were reported as lower limits of detection (LLD). The LLD results for all samples ranged from <0.33 to <0.78 pCi/liter.

K-40 was the most abundant radionuclide detected in milk samples collected in 1993. K-40 is a naturally occurring radionuclide and is found in many of the environmental media sampled. K-40 was detected in every indicator and control sample. The K-40 concentration for all samples ranged from 1190 to 2730 pCi/liter. Ra-226 was detected intermittently in the milk samples and is a naturally occurring radionuclide. During 1993, Cs-137 was not detected in any indicator or control milk samples.

C. Dose Evaluation

The calculated dose as a result of plant effluents is not evaluated due to the fact that no plant related radionuclides were detected.

The dose to man from naturally occurring concentrations of K-40 in milk and other environmental media can be calculated. This calculation illustrates that the dose received due to exposure from plant effluents is negligible as compared to the dose received from naturally occurring radionuclides. Significant levels of K-40 have been measured in environmental samples. A 70 kilogram (154 pound) adult contains approximately 0.1 microcuries of K-40 as a result of normal life functions (inhalation, consumption, etc.). The dose to bone tissue is about 20 mrem per year (Eisenbud) as a result of internally deposited naturally occurring K-40.

D. Data Trends

1993 results showed no man-made radionuclides detected in milk samples analyzed as part of the environmental surveillance program. In the past six years, Cs-137 was detected in 1986 and 1987. The mean Cs-137 indicator activity for those years was 8.6 and 7.4 pCi/liter respectively. I-131 was measured in milk samples in 1986 with a mean concentration of 13.6 pCi/liter. This activity was a result of the Chernobyl accident.

From 1976 to 1985, Cs-137 and I-131 were intermittently detected. Cs-137 was detected in a 1983 milk sample with a concentration of 5.1 pCi/liter. In 1980, I-131 was detected at the indicator and control locations with a mean concentrations of 4.9 and 1.4 pCi/liter respectively. The Cs-137 and I-131 activity is attributed to Chinese atmospheric thermonuclear weapons testing. The comparison of 1993 data to results over the operating life of the plant and preoperational data (1974) show that Cs-137 and I-131 levels have decreased significantly since 1974. The levels of Cs-137 and I-131 detected prior to the plant going into commercial operation were the result of activities not related to power production at the site.

Historical data and a graphic presentation of milk sample results for Cs-137 and I-131 are presented in Section 7.0, Tables 7-17 and 7-18 and in Section 8.0, respectively.

5.2.6 FOOD PRODUCTS (VEGETATION)

A. Results Summary

There were no plant related radionuclides detected in the 20 food product samples collected and analyzed for the 1993 program. Cs-137 was detected in one control (off-site) sample at a concentration of 0.008 pCi/g. The presence of Cs-137 in the control sample is the result of fallout from atmospheric weapons testing. Detectable levels of naturally occurring K-40 were measured in all control and indicator samples collected for the 1993 program. Be-7, a second naturally occurring radionuclide, was detected in 18 of the 20 samples collected. These results are consistent with the levels measured in 1992 and previous years.

B. Data Analysis and Discussion

Food product samples were collected from five indicator locations and one control location. The collection of annual food product samples became a requirement as a result of Technical Specification Amendment 127 in 1985. The indicator locations are represented by nearby gardens in areas of highest D/Q (deposition factor) values based on historical meteorology and an annual garden census. The control location was a garden 15 miles away in a predominately upwind direction.

Food product samples collected during 1993, included cabbage and swiss chard. These sample types are considered broadleaf vegetables. Where broadleaf vegetables were not available, non-edible broadleaf vegetation was collected. Non-edible vegetation consisting of bean leaves, squash leaves, grape leaves, pepper leaves, cucumber leaves and a tomato were collected for the 1993 program. Samples were collected during the late summer/fall harvest season.

Each sample was analyzed for gamma emitters on a GeLi/HPGe detector. One fallout radionuclide, Cs-137 was detected in the 1993 samples. Cs-137 was measured in the cucumber leaf sample collected from the control location. The presence of Cs-137 in the control sample is attributed to atmospheric weapons testing fallout.

Naturally occurring Be-7, K-40, Ra-226 and ^cTh-228 were detected in food product samples. The concentration of Be-7 in vegetation samples ranged from 0.09 to 2.48 pCi/g (wet). The concentration of K-40 in indicator and control samples ranged from 1.92 pCi/g (wet) and 6.95 pCi/g (wet). Ra-226 and AcTh-228 were detected intermittently in the samples. The results for naturally occurring radionuclides are consistent with those of prior years. Analytical results for food products are found in Section 6.0, Table 6-14.

C. Dose Evaluation

The food product sampling results showed no dose to man from this pathway as a result of operation of the plant. No plant related radionuclides were detected in any of the samples taken.

D. Data Trends

There was one man-made radionuclide (Cs-137) detected in broadleaf edible and non-edible vegetation samples analyzed in 1993. Food product results for the last five years show no trend other than that plant related radionuclides are not routinely detected in this sample media. In the previous five years Cs-137 was detected in three of the 107 samples collected. This fact is also accurate for the entire time period of plant operation including preoperational results. Cs-137 has been detected in four separate years since operation began at the FitzPatrick Power Plant.

In 1989, Cs-137 was detected in one non-edible broadleaf vegetation sample collected at an indicator location. The concentration was 0.011 pCi/g (wet) which was close to its LLD. LLD values for all other samples ranged from <0.011 to <0.018 pCi/g (wet). Cs-137 was also detected in 1988. Other than naturally occurring levels of Be-7 and K-40, no other radioisotopes were detected from 1986 - 1989.

During the period of 1981 - 1985, Cs-137, Be-7 and K-40 were detected. Cs-137 was found at one indicator location during 1985 at a concentration of 0.047 pCi/g (wet). The levels of Be-7 and K-40 were consistent with natural background levels. There are no discernable trends indicating the presence of plant related radionuclides in food product vegetation samples.

Historical data and graphic presentations of food product results are presented in Section 7.0, Tables 7-19 and 7-20, and in Section 8.0.

5.2.7 LAND USE CENSUS RESULTS

A. Results Summary

Technical Specifications require that an annual land use census be performed to identify potential new locations for milk sampling and for calculating the dose to man from plant effluents. In 1993 a milk animal census, a nearest resident census and a garden survey were performed.

No changes were required to milk sampling indicator or control locations in 1993 based on the 1993 milk animal census.

The results of the closest residence census conducted in 1993 required no change to the ODCM closest resident dose calculation reference.

A garden census, not required by Technical Specifications, showed no changes to food product (vegetation) sampling locations for 1993. The garden samples were collected from those locations listed in Table H-1 of the ODCM and identified in the census as active for 1993.

B. Data Evaluation and Discussion

A land use census is conducted each year to determine the utilization of land in the vicinity of the site. The land use census actually consists of two types of census. A milk animal census is conducted to identify all milk animals within a distance of 10 miles from the site. A census covering areas out to a distance of 10 miles exceeds the 5 mile distance required by the Technical Specifications. A resident census is designed to identify the nearest resident in each meteorological sector out to a distance of five miles.

The milk animal census is an estimation of the number of cows and goats within an approximate ten mile radius of the Nine Mile Point Site. The annual census is conducted during the first half of the grazing season by sending questionnaires to previous milk animal owners and also by road surveys to locate any possible new locations. In the event the questionnaires are not answered, the owners are contacted by telephone or in person. The

local county agricultural agency is also contacted as a further source of information concerning new milk animal locations in the vicinity of the site.

The number of milch animals estimated by the 1993 census was 1036 cows and 10 goats. This is an decrease of 84 cows and a increase of 3 goats from 1992.

The locations identified as a result of the milk animal census are illustrated on a map in Section 3.3, Figure 3.3-4.

The results of the milk animal census are found in Section 6.0, Table 6-13.

The second type of census is a residence census. The census is conducted in order to identify the closest residence within 3 miles in each of the 22.5 degree land based meteorological sectors. There are only eight sectors over land where residences are located within 3 miles. These water sectors include: N, NNE, NE, ENE, W, WNW, NW and NNW. The results of the residence census showing the applicable sectors and degrees and distance of each of the nearest residence are found in Section 6.0, Table 6-15.

The nearest resident locations are illustrated on a map in Section 3.3, Figure 3.3-5.

5.3 CONCLUSION

The REMP is a continuous program implemented to determine the radiological impact of JAFNPP operations on the local environment. The program is designed and implemented to be sensitive to small changes in the radiological environment surrounding the site.

The results of the 1993 Radiological Environmental Surveillance Program continues to clearly demonstrate that there is no significant short term or chronic long term detrimental impact on the environment in the vicinity of the Nine Mile Point site. The environmental releases from the plant contribute no measurable radiation exposures to the general public as demonstrated by the assessment of environmental media collected and analyzed as part of the ongoing environmental program. The major radiological impact on the environment remains the result of atmospheric weapons testing in the early 1980s and the 1986 accident at the Chernobyl Nuclear Power Plant. Both of these source terms have contributed to the ubiquitous inventory of Cs-137. The results for the 1993 sample program demonstrate that the concentrations of manmade radionuclides continue to decline since the last major source term in 1986. This reduction in environmental concentrations will allow for the site environmental program to become more sensitive to the measurable impact of plant operations on the environment.

Samples representing food sources consumed at higher trophic levels, such as fish and milk, were reviewed closely to evaluate any impact to the environment or to man. In addition, the data was reviewed for possible short and long term historical trends. No measurable environmental impact could be determined as a result from radionuclide deposition considering all possible sources.

Doses as a result of naturally occurring radionuclides such as K-40 and Ra-226, contributed the major portion of the total annual dose to members of the general public. During 1993, the presence of one fission product radionuclide (Cs-137) was measured in the different sample media. These samples were shoreline sediment, fish and vegetation. The probable source of this radionuclide is past weapons testing. The impact, expressed as a dose to man, is minimal. The maximum potential dose to man calculated as received from the fish consumption pathway was 0.037 mrem whole body (adult) and 0.054 mrem to the critical organ (teen livers). The long term doses to man as a result of anthropogenic sources can mainly be attributed to the Chernobyl accident and atmospheric weapons testing. Most of the radionuclides detected in 1986 as a result of Chernobyl were not

detected in subsequent years. Dose received from man-made sources are very small when compared to the dose from naturally occurring sources of radioactivity.

The contribution to the whole body dose as a result of plant operations is extremely small when compared to the dose contribution from natural background levels and sources other than the plant. Whole body doses in Oswego County due to all natural sources is approximately 60 mrem per individual per year as demonstrated by control environmental TLDs. The fraction of the annual dose to man attributable to site operation remains insignificant.

5.4 REFERENCE

1. Radiological Effluent Technical Specifications, Appendix B to Facility Operating License No. DPR-59 For James A. FitzPatrick Nuclear Power Plant, New York Power Authority, Docket No. 50-333, Amendment 127.

2. U.S. Nuclear Regulatory Commission Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluent for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix 1", October, 1977.

3. Eichholz, G., Environmental Aspects of Nuclear Power, First Edition, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1976.

4. National Council on Radiation Protection and Measurements (NCRP), Environmental Radiation Measurements, NCRP Report No. 50, 1976.

5. National Council on Radiation Protection and Measurements (NCRP), Natural Background Radiation in the United States, NCRP Report No. 45, 1975.

6. National Council on Radiation Protection and Measurements (NCRP), Cesium-137 from the Environment to Man: Metabolism and Dose, NCRP Report No. 52, 1977.

7. National Council on Radiation Protection and Measurements (NCRP), Radiation Exposure from Consumer Products and Miscellaneous Sources, NCRP Report No. 56, 1977.

8. U.S. Nuclear Regulatory Commission Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", December 1975.

9. U.S. Nuclear Regulatory Commission Branch Technical Position to Regulatory Guide 4.8, "An Acceptable Radiological Environmental Monitoring Program", November, 1979.

10. Eisenbud, Merril, Environmental Radioactivity, Third Edition, Academic Press, New York, New York, 1987.

11. Francis, C. W., Radiostrontium Movement in Soils and Uptake in Plants, Environmental Sciences Division, Oak Ridge National Laboratory, U.S. Department of Energy, 1978.

12. National Council on Radiation Protection and Measurements (NCRP), Radiation Exposure from Consumer Products and Miscellaneous Sources, NCRP Report No. 56, 1977.

13. Pochin, Edward E., Estimated Population Exposure from Nuclear Power Production and Other Radiation Sources, Organization for Economic Co-operation and Development, 1976.

14. ICRP Publication Number 29, Radionuclide Releases into the Environment: Assessment of Dose to Man, 1979.

15. U.S. Department of Health and Human Services, Preparedness and Response in Radiation Accidents, National Center of Devices and Radiological Health, Rockville, MD 20857, August, 1983.

16. Kathren, Ronald E., RADIOACTIVITY IN THE ENVIRONMENT: SOURCES, DISTRIBUTION, AND SURVEILLANCE, First Edition, Harwood Academic Press, New York, NY, 1984.

17. National Council on Radiation Protection and Measurement (NCRP), Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 93, 1987

18. Knoll, G., Radiation Detection and Measurement, Second Edition, John Wiley & Sons, New York, New York, 1989.

6.0 REPORT PERIOD ANALYTICAL RESULTS TABLES

6.1 Environmental sample data is summarized in table format. Tables are provided for select sample media and contain data based on actual values obtained over the year. These values are comprised of both positive values and LLD values where applicable.

6.2 The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability and with 5% probability of falsely concluding that a blank observation represents a "real" signal (see Section 3.7.3 for detailed explanation).

6.3 When the initial count of a sample indicates the presence of radioactivity, two recounts are normally performed. When a radionuclide is positively identified in two or more counts, the analytical results for that radionuclide is reported as the mean of the positive detections and the associated error for that mean (see Section 3.7.2 for methodology).

6.4 Many of the tables are footnoted with the term "Plant Radionuclides". Plant related radionuclides are radionuclies that are produced in the reactor as a result of plant operation either through the activation or fission process.

TABLE 6-1

CONCENTRATIONS OF GAMMA EMITTERS IN SHORELINE SEDIMENT SAMPLES

Results in Units of pCi/g (dry) ± 1 Sigma

STATION CODE*	COLLECTION DATE	GAMMA EMITTERS					
		K-40	Co-60	Cs-134	Cs-137	Zn-65	OTHERS**
Sunset Beach (05)	05/93	20.5±0.4	<0.08	<0.08	0.46±0.02	<0.24	<LLD
	10/93	19.6±0.34	<0.06	<0.06	0.18±0.01	<0.15	<LLD
Lang's Beach (06, Control)	04/93	10.5±0.2	<0.04	<0.04	0.027±0.009	<0.14	<LLD
	10/93	12.7±0.5	<0.05	<0.06	<0.04	<0.15	<LLD

* Corresponds to sample locations noted on the maps in Section 3.3.

** Plant Related Isotopes

TABLE 6-2

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES

Results in Units of pCi/g (wet) ± 1 Sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					FITZPATRICK					
06/08/93	Lake Trout	3.15±0.18	<0.024	<0.024	<0.068	<0.030	<0.063	<0.022	<0.023	<LLD
06/08/93	Brown Trout	4.76±0.21	<0.026	<0.031	<0.071	<0.028	<0.072	<0.024	<0.022	<LLD
06/15/93	Smallmouth Bass	6.46±0.13	<0.031	<0.032	<0.082	<0.030	<0.086	<0.032	0.026±0.005	<LLD
06/18/93	White Sucker	9.23±0.24	<0.029	<0.032	<0.070	<0.035	<0.084	<0.038	<0.030	<LLD
09/14/93	Brown Trout	3.65±0.21	<0.025	<0.036	<0.078	<0.035	<0.067	<0.025	<0.022	<LLD
09/14/93	Chinook Salmon	5.63±0.13	<0.027	<0.037	<0.090	<0.029	<0.068	<0.027	0.035±0.006	<LLD
09/14/93	Walleye	5.54±0.12	<0.024	<0.029	<0.088	<0.031	<0.064	<0.024	0.027±0.005	<LLD
09/14/93	Smallmouth Bass	4.27±0.13	<0.032	<0.038	<0.085	<0.025	<0.067	<0.026	0.025±0.005	<LLD

* Plant Related Radionuclides

TABLE 6-2 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES

Results in Units of pCi/g (wet) ± 1 Sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					NINE MILE POINT					
06/08/93	Brown Trout	5.54±0.12	<0.025	<0.035	<0.079	<0.028	<0.071	<0.024	<0.025	<LLD
06/15/93	White Sucker	10.0±0.2	<0.030	<0.033	<0.076	<0.031	<0.091	<0.040	<0.030	<LLD
06/17/93	Lake Trout	3.50±0.11	<0.024	<0.026	<0.050	<0.029	<0.066	<0.021	0.024±0.004	<LLD
06/17/93	Walleye	3.28±0.13	<0.025	<0.025	<0.060	<0.030	<0.057	<0.024	0.035±0.006	<LLD
09/14/93	White Sucker	9.12±0.25	<0.034	<0.047	<0.107	<0.034	<0.088	<0.034	<0.028	<LLD
09/14/93	Smallmouth Bass	4.21±0.13	<0.029	<0.039	<0.101	<0.031	<0.066	<0.027	<0.025	<LLD
09/21/93	Chinook Salmon	4.98±0.13	<0.026	<0.029	<0.081	<0.033	<0.075	<0.025	0.018±0.005	<LLD
09/21/93	Walleye	4.35±0.19	<0.026	<0.033	<0.086	<0.037	<0.068	<0.030	0.030±0.006	<LLD
09/21/93	Brown Trout	5.24±0.22	<0.027	<0.032	<0.069	<0.031	<0.078	<0.025	<0.023	<LLD

* Plant Related Radionuclides

TABLE 6-2 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES

Results in Units of pCi/g (wet) ± 1 Sigma

DATE	TYPE	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	OTHERS*
					OSWEGO HARBOR (Control)					
06/08/93	Brown Trout	3.87±0.26	<0.034	<0.044	<0.112	<0.043	<0.102	<0.035	<0.030	<LLD
06/15/93	White Sucker	3.25±0.17	<0.024	<0.027	<0.059	<0.026	<0.055	<0.021	<0.021	<LLD
06/17/93	Lake Trout	4.05±0.25	<0.034	<0.040	<0.083	<0.048	<0.100	<0.030	<0.029	<LLD
06/17/93	Walleye	3.97±0.11	<0.027	<0.028	<0.057	<0.029	<0.071	<0.027	0.036±0.005	<LLD
06/17/93	Smallmouth Bass	5.46±0.38	<0.054	<0.054	<0.135	<0.064	<0.129	<0.047	<0.047	<LLD
09/14/93	Brown Trout	3.60±0.21	<0.028	<0.039	<0.093	<0.029	<0.067	<0.028	<0.023	<LLD
09/14/93	Chinook Salmon	4.00±0.12	<0.027	<0.042	<0.098	<0.033	<0.078	<0.025	0.030±0.007	<LLD
09/17/93	Walleye	4.97±0.23	<0.032	<0.035	<0.092	<0.038	<0.080	<0.026	<0.026	<LLD
09/17/93	Smallmouth Bass	3.55±0.22	<0.035	<0.036	<0.099	<0.034	<0.064	<0.027	<0.026	<LLD
09/17/93	White Sucker	4.93±0.22	<0.028	<0.034	<0.090	<0.024	<0.087	<0.026	<0.024	<LLD

* Plant Related Radionuclides

TABLE 6-3

CONCENTRATIONS OF TRITIUM IN SURFACE WATER (QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/liter ± 1 Sigma

STATION CODE	PERIOD	DATE	TRITIUM
FITZPATRICK* (03, INLET)	First Quarter	01/04/93 - 03/31/93	280±110
	Second Quarter	03/31/93 - 06/30/93	200±100
OSWEGO STEAM* STATION (08, CONTROL)	First Quarter	12/31/92 - 03/31/93	230±110
	Second Quarter	03/31/93 - 06/30/93	180±100
NINE MILE POINT UNIT 1** (09, INLET)	First Quarter	12/31/92 - 03/31/93	320±110
	Second Quarter	03/31/93 - 06/30/93	200±100
NINE MILE POINT UNIT 2** (11, INLET)	First Quarter	12/31/92 - 03/31/93	220±110
	Second Quarter	03/31/93 - 06/30/93	220±100
OSWEGO CITY** WATER (10)	First Quarter	12/31/92 - 03/31/93	220±110
	Second Quarter	03/31/93 - 06/30/93	220±100

* Samples required by the Technical Specifications

** Optional samples
Oswego City Water samples are composites of twice per week grab samples

TABLE 6-3 (CONTINUED)

CONCENTRATIONS OF TRITIUM IN SURFACE WATER (QUARTERLY COMPOSITE SAMPLES)

Results in Units of pCi/liter ± 1 Sigma

STATION CODE	PERIOD	DATE	TRITIUM
FITZPATRICK* (03, INLET)	Third Quarter	06/30/93 - 09/30/93	230±100
	Fourth Quarter	09/30/93 - 12/29/93	260±100
OSWEGO STEAM* STATION (08, CONTROL)	Third Quarter	06/30/93 - 09/30/93	180±100
	Fourth Quarter	09/30/93 - 12/30/93	160±100
NINE MILE POINT UNIT 1** (09, INLET)	Third Quarter	06/30/93 - 09/30/93	170±100
	Fourth Quarter	09/30/93 - 12/30/93	160±100
NINE MILE POINT UNIT 2** (11, INLET)	Third Quarter	06/30/93 - 09/30/93	330±100
	Fourth Quarter	09/30/93 - 12/30/93	200±90
OSWEGO CITY** WATER (10)	Third Quarter	06/30/93 - 09/30/93	180±100
	Fourth Quarter	09/30/93 - 12/30/93	230±100

* Samples required by the Technical Specifications

** Optional samples
Oswego City Water samples are composites of twice per week grab samples

TABLE 6-4

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1993

Results in Units of pCi/liter ± 1 Sigma

STATION CODE*	NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
OSWEGO STEAM† STATION (08, CONTROL)	I-131	<0.70	<1.00	<1.00	<0.5	<1.00	<0.40
	Cs-134	<2.74	<3.92	<3.21	<3.52	<3.53	<2.90
	Cs-137	<3.24	<3.34	<3.38	<2.92	<3.47	<3.56
	Zr-95	<6.48	<6.41	<6.10	<6.80	<7.47	<6.44
	Nb-95	<4.08	<4.37	<3.99	<4.26	<4.58	<4.09
	Co-58	<3.36	<4.10	<3.55	<4.16	<5.16	<3.51
	Mn-54	<3.18	<3.75	<3.05	<3.33	<3.86	<3.05
	Fe-59	<7.88	<7.94	<8.43	<8.43	<8.90	<8.20
	Zn-65	<8.39	<8.52	<8.36	<9.09	<8.23	<8.11
	Co-60	<4.02	<4.42	<4.04	<3.25	<4.50	<4.04
	K-40	54±12	33±14	57±12	185±18	620±16	57±15
	Ba/La-140	<10.9	<12.6	<9.25	<10.1	<12.2	<10.9
FITZPATRICK† (03, INLET)	I-131	<0.80	<1.00	<1.00	<1.0	<1.00	<0.40
	Cs-134	<4.34	<3.09	<3.80	<2.73	<3.45	<5.96
	Cs-137	<3.59	<3.30	<3.20	<2.35	<3.29	<4.54
	Zr-95	<6.36	<6.91	<7.40	<4.90	<6.89	<8.84
	Nb-95	<4.00	<4.32	<4.48	<3.81	<4.49	<5.87
	Co-58	<4.02	<3.52	<3.80	<3.23	<3.91	<5.11
	Mn-54	<4.12	<3.50	<3.75	<2.76	<3.59	<4.54
	Fe-59	<9.20	<8.65	<8.43	<6.80	<8.29	<12.4
	Zn-65	<10.0	<8.10	<10.2	<6.61	<8.54	<12.2
	Co-60	<4.33	<3.57	<3.75	<3.34	<3.97	<3.97
	K-40	1020±28	44±13	246±20	58±12	220±18	1150±31
	Ba/La-140	<7.97	<8.91	<10.2	<11.2	<9.69	<8.63

* Corresponds to sample locations noted on the maps in Section 3.3.

† Samples required by the Technical Specifications.

TABLE 6-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1993

Results in Units of pCi/liter ± 1 Sigma

STATION CODE*	NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
NINE MILE POINT UNIT 1** (09, INLET)	I-131	<9.78	<10.1	<9.23	<12.1	<9.74	<7.15
	Cs-134	<2.97	<2.99	<3.36	<5.68	<3.18	<3.80
	Cs-137	<3.11	<3.13	<3.56	<4.61	<3.25	<3.51
	Zr-95	<6.62	<5.77	<6.43	<8.29	<6.87	<5.76
	Nb-95	<4.31	<3.85	<4.44	<5.59	<4.31	<4.15
	Co-58	<3.66	<3.30	<3.68	<5.09	<3.54	<4.34
	Mn-54	<3.03	<3.09	<3.54	<4.24	<3.24	<4.03
	Fe-59	<7.28	<8.40	<7.99	<10.8	<8.86	<8.90
	Zn-65	<6.77	<8.01	<8.82	<13.2	<9.47	<9.03
	Co-60	<3.71	<4.41	<3.98	<4.57	<3.72	<5.27
	K-40	50±12	46±15	68±13	1040±29	60±12	72±14
	Ba/La-140	<11.0	<11.4	<11.9	<6.70	<12.7	<10.4
NINE MILE POINT UNIT 2** (11, INLET)	I-131	<10.9	<11.9	<8.47	<12.7	<14.4	<12.5
	Cs-134	<3.35	<3.49	<3.63	<3.45	<4.95	<5.90
	Cs-137	<3.27	<3.31	<3.45	<3.04	<4.82	<4.54
	Zr-95	<5.93	<7.25	<6.36	<7.37	<11.2	<8.95
	Nb-95	<3.82	<4.90	<4.14	<5.15	<7.32	<5.60
	Co-58	<3.72	<3.95	<4.18	<4.56	<6.47	<4.91
	Mn-54	<3.21	<3.59	<3.85	<3.45	<5.86	<4.52
	Fe-59	<9.48	<7.94	<9.41	<7.78	<14.7	<11.5
	Zn-65	<7.40	<8.52	<8.41	<9.31	<14.6	<14.1
	Co-60	<4.02	<4.42	<3.83	<4.67	<7.63	<5.05
	K-40	55±12	33±14	58±15	226±18	138±26	1080±30
	Ba/La-140	<11.8	<12.6	<10.3	<13.2	<12.9	<9.53

* Corresponds to sample locations noted on the maps in Section 3.3.

** Optional sample location. Samples not required by Technical Specifications.

TABLE 6-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1993

Results in Units of pCi/liter ± 1 Sigma

STATION CODE*	NUCLIDE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
OSWEGO CITY WATER** (10)	I-131	<10.3	<11.5	<13.4	<7.14	<9.77	<8.59
	Cs-134	<3.22	<3.50	<5.81	<3.47	<3.17	<4.03
	Cs-137	<3.05	<3.12	<4.84	<3.14	<3.55	<3.37
	Zr-95	<7.22	<7.46	<9.10	<6.13	<6.56	<5.94
	Nb-95	<4.59	<4.97	<5.61	<4.16	<4.43	<4.10
	Co-58	<3.93	<3.79	<5.01	<4.14	<3.94	<4.45
	Mn-54	<2.93	<3.84	<4.40	<3.71	<3.34	<3.84
	Fe-59	<7.32	<8.28	<11.7	<7.47	<9.05	<8.93
	Zn-65	<7.90	<9.74	<13.4	<7.99	<7.78	<9.74
	Co-60	<4.08	<3.81	<4.50	<4.00	<3.65	<4.79
	K-40	62±14	19±17	1150±31	44±14	78±15	60±15
	Ba/La-140	<10.7	<11.9	<9.53	<10.6	<9.05	<12.4

* Corresponds to sample locations noted on the maps in Section 3.3.

** Optional sample location. Samples not required by Technical Specifications.

TABLE 6-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1993

Results in Units of pCi/liter ± 1 Sigma

STATION CODE*	NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
OSWEGO STEAM† STATION (08, CONTROL)	I-131	<0.90	<0.30	<0.30	<0.80	<0.30	<
	Cs-134	<3.44	<2.85	<2.91	<3.23	<4.25	<2.98
	Cs-137	<3.47	<2.93	<3.19	<2.80	<3.32	<3.05
	Zr-95	<6.55	<7.60	<5.76	<7.24	<7.84	<6.19
	Nb-95	<4.12	<4.22	<3.43	<4.95	<5.00	<4.41
	Co-58	<4.32	<3.48	<3.33	<4.27	<4.30	<3.70
	Mn-54	<3.84	<3.04	<3.39	<3.66	<3.53	<2.90
	Fe-59	<8.08	<8.13	<8.44	<8.05	<8.71	<8.55
	Zn-65	<8.67	<7.85	<8.05	<7.67	<9.88	<7.63
	Co-60	<4.65	<3.85	<3.57	<4.43	<4.84	<3.94
	K-40	150±12	55±15	65±13	214±19	197±19	240±17
	Ba/La-140	<12.4	<12.3	<9.47	<11.1	<8.60	<11.4
FITZPATRICK† (03, INLET)	I-131	<0.80	<0.20	<0.40	<0.90	<0.40	<0.40
	Cs-134	<3.26	<3.90	<3.44	<4.52	<3.22	<4.23
	Cs-137	<3.08	<3.23	<3.22	<3.93	<2.89	<3.63
	Zr-95	<6.43	<6.37	<6.85	<8.07	<6.36	<7.85
	Nb-95	<4.70	<4.51	<4.64	<4.90	<3.97	<4.98
	Co-58	<3.42	<4.26	<4.06	<4.15	<3.69	<4.25
	Mn-54	<3.37	<4.05	<3.89	<3.95	<3.19	<3.97
	Fe-59	<9.07	<9.94	<8.00	<9.96	<8.30	<8.18
	Zn-65	<8.27	<9.78	<9.09	<9.60	<7.85	<9.56
	Co-60	<3.92	<4.18	<4.02	<6.03	<4.17	<4.34
	K-40	54±13	86±15	273±21	213±23	57±14	77±24
	Ba/La-140	<10.3	<12.9	<10.1	<12.1	<10.3	<7.65

* Corresponds to sample locations noted on the maps in Section 3.3.

† Samples required by the Technical Specifications.

TABLE 6-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1993

Results in Units of pCi/liter ± 1 Sigma

STATION CODE*	NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
NINE MILE POINT UNIT 1** (09, INLET)	I-131	<8.17	<12.4	<10.1	<11.0	<12.2	<13.1
	Cs-134	<3.08	<3.20	<3.30	<3.39	<4.39	<2.91
	Cs-137	<3.28	<3.01	<3.11	<3.19	<3.23	<2.86
	Zr-95	<6.15	<7.60	<5.95	<7.22	<7.66	<5.58
	Nb-95	<3.93	<4.86	<4.28	<4.34	<5.06	<4.11
	Co-58	<3.38	<4.50	<3.99	<4.04	<4.47	<3.00
	Mn-54	<3.39	<3.80	<3.65	<3.95	<4.08	<2.64
	Fe-59	<7.98	<8.67	<8.63	<9.19	<8.88	<8.08
	Zn-65	<8.05	<10.5	<9.04	<9.99	<10.0	<6.64
	Co-60	<4.52	<4.08	<3.92	<3.75	<3.78	<3.54
	K-40	35±13	232±19	244±19	247±19	908±26	68±12
	Ba/La-140	<10.7	<11.5	<9.56	<10.8	<8.17	<12.3
NINE MILE POINT UNIT 2** (11, INLET)	I-131	<9.48	<14.2	<9.21	<13.1	<9.10	<13.9
	Cs-134	<3.52	<5.52	<3.43	<4.10	<3.45	<2.29
	Cs-137	<3.31	<4.26	<3.34	<3.69	<3.34	<2.17
	Zr-95	<6.80	<8.43	<6.54	<8.05	<5.60	<5.41
	Nb-95	<4.79	<5.72	<4.04	<5.07	<3.93	<3.83
	Co-58	<4.00	<4.66	<3.64	<4.49	<3.82	<3.04
	Mn-54	<3.50	<4.08	<3.19	<3.94	<3.36	<2.65
	Fe-59	<8.35	<11.1	<8.83	<9.16	<9.07	<6.79
	Zn-65	<8.55	<12.6	<8.75	<9.80	<7.76	<6.67
	Co-60	<4.38	<4.36	<3.78	<3.60	<4.29	<2.58
	K-40	200±18	1190±28	41±12	873±26	43±14	217±13
	Ba/La-140	<9.04	<8.98	<9.79	<7.13	<10.6	<9.75

* Corresponds to sample locations noted on the maps in Section 3.3.

** Optional sample location. Samples not required by Technical Specifications.

TABLE 6-4 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES - 1993

Results in Units of pCi/liter ± 1 Sigma

STATION CODE*	NUCLIDE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
OSWEGO CITY	I-131	<12.3	<11.7	<10.8	<13.6	<13.1	<13.8
WATER**	Cs-134	<3.14	<3.57	<4.23	<4.15	<4.34	<2.89
(10)	Cs-137	<3.29	<3.16	<4.10	<3.59	<3.55	<2.85
	Zr-95	<6.80	<7.49	<7.92	<8.32	<7.79	<5.64
	Nb-95	<4.32	<4.75	<5.00	<5.65	<4.78	<3.79
	Co-58	<4.29	<4.01	<4.88	<4.52	<4.55	<3.10
	Mn-54	<3.21	<4.06	<3.70	<3.95	<3.86	<2.68
	Fe-59	<8.79	<9.42	<9.25	<9.12	<8.41	<8.21
	Zn-65	<7.98	<9.74	<9.41	<10.6	<10.0	<6.70
	Co-60	<3.79	<4.48	<4.22	<3.76	<4.03	<3.55
	K-40	81±14	284±21	216±24	857±25	944±27	208±15
	Ba/La-140	<12.5	<11.2	<11.6	<9.29	<7.89	<11.6

* Corresponds to sample locations noted on the maps in Section 3.3.

** Optional sample location. Samples not required by Technical Specifications.

TABLE 6-5

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF-SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 1 SIGMA

LOCATION

WEEK END DATE	R-1 OFF*	R-2 OFF*	R-3 OFF*	R-4 OFF*	R-5 OFF*	D-2 OFF	E-OFF	F-OFF	G-OFF
01/05/93	0.010±0.001	0.011±0.001	0.010±0.001	0.009±0.001	0.009±0.001	0.009±0.001	0.010±0.001	0.009±0.001	0.008±0.001
01/12/93	0.020±0.001	0.021±0.001	0.021±0.001	0.020±0.001	0.022±0.001	0.022±0.001	0.023±0.001	0.021±0.001	0.022±0.001
01/19/93	0.016±0.001	0.017±0.001	0.016±0.001	0.018±0.001	0.014±0.001	0.009±0.001	0.018±0.001	0.015±0.001	0.014±0.001
01/26/93	0.013±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.011±0.001	0.011±0.001	0.010±0.001	0.012±0.001	0.009±0.001
02/02/93	0.016±0.001	0.016±0.001	0.015±0.001	0.017±0.001	0.015±0.001	0.016±0.001	0.012±0.001	0.015±0.001	0.014±0.001
02/09/93	0.018±0.001	0.019±0.001	0.020±0.001	0.018±0.001	0.018±0.001	0.020±0.001	0.016±0.001	0.017±0.001	0.015±0.001
02/16/93	0.012±0.001	0.014±0.001	0.014±0.001	0.013±0.001	0.012±0.001	0.012±0.001	0.016±0.001	0.014±0.001	0.013±0.001
02/23/93	0.013±0.001	0.017±0.001	0.014±0.001	0.015±0.001	0.013±0.001	0.014±0.001	0.016±0.001	0.014±0.001	0.015±0.001
03/02/93	0.015±0.001	0.016±0.001	0.016±0.001	0.015±0.001	0.015±0.001	0.016±0.001	0.014±0.001	0.015±0.001	0.013±0.001
03/09/93	0.021±0.001	0.022±0.001	0.018±0.001	0.021±0.001	0.018±0.001	0.018±0.001	0.020±0.001	0.021±0.001	0.016±0.001
03/16/93	0.010±0.001	0.017±0.001	0.012±0.001	0.012±0.001	0.013±0.001	0.012±0.001	0.015±0.001	0.012±0.001	0.017±0.001
03/23/93	0.016±0.001	0.015±0.001	0.016±0.001	0.016±0.001	0.015±0.001	0.017±0.001	0.015±0.001	0.017±0.001	0.013±0.001
03/30/93	0.008±0.001	0.009±0.001	0.009±0.001	0.007±0.001	0.007±0.001	0.006±0.001	0.009±0.001	0.008±0.001	0.006±0.001
04/06/93	0.009±0.001	0.011±0.001	0.009±0.001	0.009±0.001	0.009±0.001	0.008±0.001	0.009±0.001	0.009±0.001	0.008±0.001
04/13/93	0.007±0.001	0.006±0.001	0.005±0.001	0.007±0.001	0.007±0.001	0.006±0.001	0.007±0.001	0.006±0.001	0.005±0.001
04/20/93	0.013±0.001	0.013±0.001	0.012±0.001	0.014±0.001	0.012±0.001	0.013±0.001	0.011±0.001	0.012±0.001	0.011±0.001
04/27/93	0.012±0.001	0.014±0.001	0.014±0.001	0.012±0.001	0.010±0.001	0.011±0.001	0.012±0.001	0.012±0.001	0.011±0.001
05/04/93	0.012±0.001	0.013±0.001	0.015±0.001	0.013±0.001	0.013±0.001	0.014±0.001	0.015±0.001	0.014±0.001	0.010±0.001
05/11/93	0.012±0.001	0.014±0.001	0.013±0.001	0.014±0.001	0.012±0.001	0.012±0.001	0.015±0.001	0.012±0.001	0.011±0.001
05/18/93	0.012±0.001	0.010±0.001	0.011±0.001	0.011±0.001	0.008±0.001	0.011±0.001	0.012±0.001	0.011±0.001	0.008±0.001
05/25/93	0.010±0.001	0.013±0.001	0.011±0.001	0.011±0.001	0.009±0.001	0.013±0.001	0.012±0.001	0.009±0.001	0.010±0.001
06/01/93	0.007±0.001	0.008±0.001	0.007±0.001	0.008±0.001	0.007±0.001	0.007±0.001	0.008±0.001	0.006±0.001	0.005±0.001
06/08/93	0.010±0.001	0.012±0.001	0.008±0.001	0.010±0.001	0.009±0.001	0.009±0.001	0.011±0.001	0.011±0.001	0.008±0.001
06/15/93	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.008±0.001	0.012±0.001
06/22/93	0.010±0.001	0.011±0.001	0.009±0.001	0.010±0.001	0.010±0.001	0.009±0.001	0.011±0.001	0.008±0.001	0.008±0.001
06/29/93	0.010±0.001	0.015±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.013±0.001	0.010±0.001	0.013±0.001	0.011±0.001

* Sample locations required by Technical Specifications

TABLE 6-5 (CONTINUED)

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - OFF-SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK END DATE	R-1 OFF*	R-2 OFF*	R-3 OFF*	R-4 OFF*	R-5 OFF*	D-2 OFF	E-OFF	F-OFF	G-OFF
07/06/93	0.013±0.001	0.013±0.001	0.012±0.001	0.012±0.001	0.013±0.001	0.011±0.001	0.012±0.001	0.012±0.001	0.011±0.001
07/13/93	0.018±0.001	0.019±0.001	0.020±0.001	0.017±0.001	0.015±0.001	0.021±0.001	0.023±0.001	0.023±0.001	0.016±0.001
07/20/93	0.011±0.001	0.010±0.001	0.011±0.001	0.009±0.001	0.008±0.001	0.010±0.001	0.010±0.001	0.008±0.001	0.009±0.001
07/27/93	0.013±0.001	0.013±0.001	0.013±0.001	0.010±0.001	0.011±0.001	0.010±0.001	0.011±0.001	0.009±0.001	0.011±0.001
08/03/93	0.012±0.001	0.012±0.001	0.013±0.001	0.011±0.001	0.013±0.001	0.012±0.001	0.013±0.001	0.012±0.001	0.010±0.001
08/10/93	0.016±0.001	0.020±0.001	0.016±0.001	0.014±0.001	0.014±0.001	0.017±0.001	0.017±0.001	0.016±0.001	0.014±0.001
08/17/93	0.019±0.001	0.023±0.001	0.023±0.001	0.018±0.001	0.020±0.001	0.019±0.001	0.019±0.001	0.016±0.001	0.017±0.001
08/24/93	0.017±0.001	0.020±0.001	0.017±0.001	0.016±0.001	0.018±0.001	0.016±0.001	0.020±0.001	0.019±0.001	0.017±0.001
08/31/93	0.020±0.001	0.018±0.001	0.025±0.001	0.021±0.001	0.021±0.001	0.021±0.001	0.020±0.001	0.021±0.001	0.019±0.001
09/07/93	0.015±0.001	0.018±0.001	0.014±0.001	0.017±0.001	0.012±0.001	0.019±0.001	0.016±0.001	0.014±0.001	0.013±0.001
09/14/93	0.014±0.001	0.015±0.001	0.016±0.001	0.014±0.001	0.014±0.001	0.016±0.001	0.015±0.001	0.013±0.001	0.014±0.001
09/21/93	0.013±0.001	0.014±0.001	0.012±0.001	0.012±0.001	0.010±0.001	0.014±0.001	0.011±0.001	0.013±0.001	0.011±0.001
09/28/93	0.013±0.001	0.013±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.012±0.001	0.011±0.001	0.013±0.001	0.012±0.001
10/05/93	0.009±0.001	0.011±0.001	0.011±0.001	0.011±0.001	0.010±0.001	0.011±0.001	0.012±0.001	0.011±0.001	0.010±0.001
10/12/93	0.016±0.001	0.017±0.001	0.018±0.001	0.019±0.001	0.019±0.001	0.016±0.001	0.015±0.001	0.018±0.001	0.015±0.001
10/19/93	0.018±0.001	0.018±0.001	0.016±0.001	0.019±0.001	0.018±0.001	0.021±0.001	0.018±0.001	0.019±0.001	0.016±0.001
10/26/93	0.013±0.001	0.014±0.001	0.013±0.001	0.011±0.001	0.010±0.001	0.014±0.001	0.015±0.001	0.012±0.001	0.011±0.001
11/02/93	0.011±0.001	0.011±0.001	0.010±0.001	0.010±0.001	0.010±0.001	0.012±0.001	0.012±0.001	0.010±0.001	0.010±0.001
11/09/93	0.016±0.001	0.017±0.001	0.016±0.001	0.014±0.001	0.017±0.001	0.016±0.001	0.016±0.001	0.016±0.001	0.013±0.001
11/16/93	0.019±0.001	0.021±0.001	0.020±0.001	0.017±0.001	0.017±0.001	0.021±0.001	0.020±0.001	0.017±0.001	0.018±0.001
11/23/93	0.013±0.001	0.015±0.001	0.016±0.001	0.014±0.001	0.015±0.001	0.017±0.001	0.015±0.001	0.016±0.001	0.012±0.001
11/30/93	0.014±0.001	0.013±0.001	0.016±0.001	0.016±0.001	0.016±0.001	0.015±0.001	0.015±0.001	0.015±0.001	0.014±0.001
12/07/93	0.017±0.001	0.016±0.001	0.017±0.001	0.018±0.001	0.017±0.001	0.019±0.001	0.018±0.001	0.017±0.001	0.017±0.001
12/12/93	0.019±0.001	0.019±0.001	0.018±0.001	0.018±0.001	0.019±0.001	0.019±0.001	0.019±0.001	0.017±0.001	0.017±0.001
12/21/93	0.015±0.001	0.014±0.001	0.014±0.001	0.015±0.001	0.016±0.001	0.017±0.001	0.017±0.001	0.015±0.001	0.014±0.001
12/28/93	0.012±0.001	0.011±0.001	0.013±0.001	0.012±0.001	0.013±0.001	0.013±0.001	0.016±0.001	0.011±0.001	0.015±0.001
01/04/94	0.013±0.001	0.013±0.001	0.013±0.001	0.013±0.001	0.015±0.001	0.015±0.001	0.011±0.001	0.014±0.001	0.012±0.001

* Sample locations required by Technical Specifications

TABLE 6-6

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ON-SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 1 SIGMA

LOCATION

WEEK END DATE	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
01/04/93	0.010±0.001	0.009±0.001	0.009±0.001	0.009±0.001	0.008±0.001	0.010±0.001
01/11/93	0.022±0.001	0.023±0.001	0.023±0.001	0.019±0.001	0.018±0.001	0.019±0.001
01/18/93	0.018±0.001	0.017±0.001	0.014±0.001	0.016±0.001	0.012±0.001	0.014±0.001
01/25/93	0.013±0.001	0.013±0.001	0.011±0.001	0.013±0.001	0.010±0.001	0.013±0.001
02/01/93	0.013±0.001	0.012±0.001	0.012±0.001	0.014±0.001	0.012±0.001	0.012±0.001
02/08/93	0.018±0.001	0.018±0.001	0.018±0.001	0.018±0.001	0.015±0.001	0.018±0.001
02/16/93	0.017±0.001	0.013±0.001	0.012±0.001	0.013±0.001	0.011±0.001	0.012±0.001
02/22/93	0.016±0.001	0.014±0.001	0.013±0.001	0.014±0.001	0.013±0.001	0.015±0.001
03/01/93	0.017±0.001	0.015±0.001	0.016±0.001	0.017±0.001	0.011±0.001	0.014±0.001
03/08/93	0.025±0.001	0.025±0.001	0.024±0.001	0.025±0.001	0.022±0.001	0.024±0.001
03/15/93	0.012±0.001	0.011±0.001	0.015±0.001	0.014±0.001	0.010±0.001	0.014±0.001
03/22/93	0.019±0.001	0.018±0.001	0.018±0.001	0.017±0.001	0.012±0.001	0.017±0.001
03/29/93	0.009±0.001	0.008±0.001	0.008±0.001	0.009±0.001	0.007±0.001	0.008±0.001
04/05/93	0.010±0.001	0.010±0.001	0.011±0.001	0.009±0.001	0.008±0.001	0.010±0.001
04/12/93	0.009±0.001	0.008±0.001	0.010±0.001	0.009±0.001	0.007±0.001	0.008±0.001
04/19/93	0.012±0.001	0.010±0.001	0.013±0.001	0.011±0.001	0.009±0.001	0.012±0.001
04/26/93	0.013±0.001	0.013±0.001	0.012±0.001	0.012±0.001	0.011±0.001	0.011±0.001
05/03/93	0.014±0.001	0.014±0.001	0.014±0.001	0.015±0.001	0.011±0.001	0.013±0.001
05/10/93	0.014±0.001	0.013±0.001	0.011±0.001	0.013±0.001	0.013±0.001	0.011±0.001
05/17/93	0.011±0.001	0.011±0.001	0.010±0.001	0.010±0.001	0.010±0.001	0.012±0.001
05/24/93	0.010±0.001	0.009±0.001	0.011±0.001	0.011±0.001	0.006±0.001	0.005±0.001
06/01/93	0.008±0.001	0.008±0.001	0.008±0.001	0.009±0.001	0.004±0.001	0.006±0.001
06/07/93	0.009±0.001	0.008±0.001	0.009±0.001	0.009±0.001	0.006±0.001	0.007±0.001
06/14/93	0.016±0.001	0.013±0.001	0.046±0.001	0.010±0.001	0.012±0.001	0.011±0.001
06/21/93	0.012±0.001	0.011±0.001	0.014±0.001	0.010±0.001	0.011±0.001	0.010±0.001
06/28/93	0.013±0.001	0.013±0.001	0.010±0.001	0.013±0.001	0.009±0.001	0.012±0.001

TABLE 6-6 (CONTINUED)

NMP/JAF SITE
ENVIRONMENTAL AIRBORNE PARTICULATE SAMPLES - ON-SITE STATIONS
GROSS BETA ACTIVITY pCi/m^3 ± 1 SIGMA

LOCATION

WEEK END DATE	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
07/06/93	0.015±0.001	0.013±0.001	0.013±0.001	0.013±0.001	0.010±0.001	0.013±0.001
07/12/93	0.020±0.001	0.020±0.001	0.021±0.001	0.018±0.001	0.018±0.001	0.016±0.001
07/19/93	0.013±0.001	0.011±0.001	0.009±0.001	0.012±0.001	0.013±0.001	0.009±0.001
07/26/93	0.011±0.001	0.012±0.001	0.012±0.001	0.014±0.001	0.012±0.001	0.011±0.001
08/02/93	0.012±0.001	0.014±0.001	0.015±0.001	0.012±0.001	0.013±0.001	0.012±0.001
08/09/93	0.013±0.001	0.014±0.001	0.018±0.001	0.020±0.001	0.014±0.001	0.013±0.001
08/16/93	0.021±0.001	0.023±0.001	0.024±0.001	0.025±0.001	0.019±0.001	0.021±0.001
08/23/93	0.015±0.001	0.017±0.001	0.014±0.001	0.015±0.001	0.014±0.001	0.014±0.001
08/30/93	0.024±0.001	0.022±0.001	0.023±0.001	0.021±0.001	0.018±0.001	0.021±0.001
09/07/93	0.013±0.001	0.016±0.001	0.017±0.001	0.017±0.001	0.011±0.001	0.013±0.001
09/13/93	0.013±0.001	0.015±0.001	0.012±0.001	0.013±0.001	0.014±0.001	0.012±0.001
09/20/93	0.013±0.001	0.016±0.001	0.015±0.001	0.014±0.001	0.012±0.001	0.015±0.001
09/27/93	0.011±0.001	0.013±0.001	0.014±0.001	0.014±0.001	0.011±0.001	0.013±0.001
10/04/93	0.011±0.001	0.011±0.001	0.011±0.001	0.011±0.001	0.009±0.001	0.010±0.001
10/11/93	0.018±0.001	0.017±0.001	0.016±0.001	0.015±0.001	0.014±0.001	0.015±0.001
10/18/93	0.016±0.001	0.017±0.001	0.016±0.001	0.015±0.001	0.014±0.001	0.016±0.001
10/25/93	0.011±0.001	0.012±0.001	0.013±0.001	0.015±0.001	0.012±0.001	0.012±0.001
11/01/93	0.009±0.001	0.008±0.001	0.010±0.001	0.011±0.001	0.010±0.001	0.012±0.001
11/08/93	0.015±0.001	0.015±0.001	0.012±0.001	0.014±0.001	0.013±0.001	0.015±0.001
11/15/93	0.022±0.001	0.023±0.001	0.020±0.001	0.024±0.001	0.021±0.001	0.020±0.001
11/22/93	0.013±0.001	0.014±0.001	0.016±0.001	0.014±0.001	0.013±0.001	0.014±0.001
11/29/93	0.014±0.001	0.010±0.001	0.016±0.001	0.012±0.001	0.012±0.001	0.014±0.001
12/06/93	0.019±0.001	0.020±0.001	0.023±0.001	0.019±0.001	0.019±0.001	0.020±0.001
12/11/93	0.019±0.001	0.020±0.001	0.023±0.001	0.019±0.001	0.019±0.001	0.020±0.001
12/20/93	0.017±0.001	0.017±0.001	0.015±0.001	0.017±0.001	0.014±0.001	0.017±0.001
12/27/93	0.013±0.001	0.014±0.001	0.013±0.001	0.013±0.001	0.012±0.001	0.012±0.001
01/03/94	0.014±0.001	0.016±0.001	0.014±0.001	0.016±0.001	0.009±0.001	0.016±0.001

TABLE 6-7

NMP/JAF SITE

ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF-SITE STATIONS

I-131 ACTIVITY $pCi/m^3 \pm 1$ SIGMA

LOCATION

WEEK END DATE	R-1*	R-2*	R-3*	R-4*	R-5*	D-2	E	F	G
01/05/93	<0.012	<0.014	<0.013	<0.009	<0.010	<0.011	<0.009	<0.009	<0.009
01/12/93	<0.016	<0.017	<0.014	<0.012	<0.014	<0.015	<0.010	<0.013	<0.011
01/19/93	<0.010	<0.012	<0.008	<0.013	<0.010	<0.015	<0.009	<0.008	<0.009
01/26/93	<0.011	<0.016	<0.015	<0.012	<0.011	<0.015	<0.009	<0.010	<0.009
02/02/93	<0.015	<0.017	<0.011	<0.014	<0.010	<0.012	<0.014	<0.014	<0.012
02/09/93	<0.014	<0.012	<0.013	<0.012	<0.009	<0.011	<0.014	<0.010	<0.010
02/16/93	<0.012	<0.014	<0.013	<0.010	<0.008	<0.010	<0.012	<0.008	<0.010
02/23/93	<0.013	<0.012	<0.011	<0.012	<0.012	<0.014	<0.012	<0.012	<0.011
03/02/93	<0.016	<0.009	<0.014	<0.010	<0.013	<0.011	<0.012	<0.010	<0.015
03/09/93	<0.011	<0.013	<0.020	<0.010	<0.009	<0.017	<0.010	<0.012	<0.016
03/16/93	<0.012	<0.014	<0.014	<0.013	<0.010	<0.014	<0.014	<0.013	<0.009
03/23/93	<0.012	<0.015	<0.010	<0.014	<0.013	<0.013	<0.010	<0.010	<0.012
03/30/93	<0.014	<0.020	<0.011	<0.013	<0.017	<0.014	<0.011	<0.018	<0.011
04/06/93	<0.016	<0.019	<0.012	<0.012	<0.017	<0.011	<0.013	<0.018	<0.011
04/13/93	<0.011	<0.013	<0.015	<0.011	<0.012	<0.019	<0.012	<0.011	<0.017
04/20/93	<0.013	<0.011	<0.010	<0.014	<0.010	<0.016	<0.013	<0.013	<0.009
04/27/93	<0.013	<0.012	<0.013	<0.014	<0.015	<0.019	<0.010	<0.017	<0.012
05/04/93	<0.013	<0.012	<0.014	<0.011	<0.012	<0.009	<0.012	<0.009	<0.012
05/11/93	<0.018	<0.011	<0.011	<0.015	<0.011	<0.016	<0.010	<0.018	<0.014
05/18/93	<0.011	<0.020	<0.009	<0.019	<0.010	<0.021	<0.013	<0.010	<0.008
05/25/93	<0.014	<0.014	<0.015	<0.012	<0.014	<0.016	<0.013	<0.011	<0.016
06/01/93	<0.011	<0.014	<0.019	<0.012	<0.008	<0.012	<0.017	<0.011	<0.018
06/08/93	<0.014	<0.011	<0.015	<0.017	<0.015	<0.016	<0.019	<0.013	<0.010
06/15/93	<0.020	<0.016	<0.015	<0.009	<0.017	<0.013	<0.012	<0.018	<0.011
06/22/93	<0.011	<0.025	<0.012	<0.019	<0.012	<0.022	<0.011	<0.020	<0.011
06/29/93	<0.015	<0.024	<0.011	<0.021	<0.012	<0.022	<0.013	<0.017	<0.015

* Sample locations required by Technical Specifications

TABLE 6-7 (CONTINUED)

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - OFF-SITE STATIONS
I-131 ACTIVITY $pCi/m^3 \pm 1$ SIGMA
LOCATION

WEEK END DATE	R-1*	R-2*	R-3*	R-4*	R-5*	D-2	E	F	G
07/06/93	<0.022	<0.018	<0.013	<0.013	<0.021	<0.013	<0.014	<0.011	<0.017
07/13/93	<0.009	<0.012	<0.018	<0.031	<0.015	<0.018	<0.022	<0.012	<0.012
07/20/93	<0.017	<0.017	<0.022	<0.016	<0.018	<0.016	<0.016	<0.008	<0.018
07/27/93	<0.018	<0.015	<0.021	<0.015	<0.012	<0.018	<0.016	<0.014	<0.014
08/03/93	<0.013	<0.015	<0.015	<0.019	<0.017	<0.016	<0.014	<0.017	<0.012
08/10/93	<0.019	<0.022	<0.019	<0.017	<0.013	<0.024	<0.015	<0.013	<0.013
08/17/93	<0.017	<0.019	<0.014	<0.012	<0.015	<0.017	<0.013	<0.011	<0.014
08/24/93	<0.017	<0.013	<0.022	<0.015	<0.010	<0.014	<0.012	<0.019	<0.018
08/31/93	<0.016	<0.017	<0.015	<0.014	<0.012	<0.014	<0.010	<0.013	<0.012
09/07/93	<0.012	<0.011	<0.010	<0.017	<0.008	<0.014	<0.016	<0.020	<0.012
09/14/93	<0.014	<0.012	<0.021	<0.013	<0.014	<0.016	<0.014	<0.019	<0.009
09/21/93	<0.014	<0.012	<0.013	<0.014	<0.012	<0.017	<0.013	<0.012	<0.011
09/28/93	<0.012	<0.013	<0.015	<0.010	<0.014	<0.015	<0.011	<0.011	<0.010
10/05/93	<0.013	<0.016	<0.013	<0.015	<0.013	<0.019	<0.008	<0.012	<0.010
10/12/93	<0.015	<0.014	<0.013	<0.015	<0.012	<0.016	<0.011	<0.011	<0.010
10/19/93	<0.017	<0.011	<0.014	<0.014	<0.015	<0.014	<0.014	<0.012	<0.011
10/26/93	<0.014	<0.013	<0.013	<0.015	<0.014	<0.011	<0.017	<0.014	<0.011
11/02/93	<0.011	<0.011	<0.014	<0.016	<0.013	<0.013	<0.016	<0.011	<0.010
11/09/93	<0.015	<0.018	<0.017	<0.014	<0.012	<0.014	<0.015	<0.012	<0.012
11/16/93	<0.013	<0.017	<0.011	<0.020	<0.012	<0.012	<0.019	<0.012	<0.012
11/23/93	<0.014	<0.016	<0.013	<0.020	<0.014	<0.017	<0.011	<0.017	<0.012
11/30/93	<0.016	<0.008	<0.013	<0.022	<0.014	<0.013	<0.016	<0.016	<0.009
12/07/93	<0.014	<0.014	<0.015	<0.014	<0.019	<0.012	<0.015	<0.012	<0.012
12/12/93	<0.012	<0.014	<0.015	<0.014	<0.016	<0.014	<0.014	<0.012	<0.011
12/21/93	<0.013	<0.012	<0.015	<0.014	<0.018	<0.013	<0.013	<0.009	<0.018
12/28/93	<0.013	<0.014	<0.011	<0.014	<0.012	<0.015	<0.010	<0.015	<0.014
01/04/94	<0.005	<0.013	<0.014	<0.013	<0.012	<0.016	<0.012	<0.012	<0.017

* Sample locations required by Technical Specifications

TABLE 6-8

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ON-SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK END	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
01/04/93	<0.014	<0.010	<0.017	<0.012	<0.017	<0.013
01/11/93	<0.013	<0.015	<0.009	<0.010	<0.016	<0.007
01/18/93	<0.015	<0.008	<0.015	<0.014	<0.015	<0.014
01/25/93	<0.010	<0.013	<0.012	<0.015	<0.010	<0.012
02/01/93	<0.012	<0.014	<0.010	<0.014	<0.016	<0.008
02/08/93	<0.012	<0.012	<0.010	<0.011	<0.009	<0.009
02/16/93	<0.012	<0.012	<0.011	<0.012	<0.009	<0.009
02/22/93	<0.017	<0.011	<0.014	<0.012	<0.015	<0.014
03/01/93	<0.017	<0.011	<0.010	<0.022	<0.013	<0.012
03/08/93	<0.019	<0.009	<0.014	<0.018	<0.012	<0.010
03/15/93	<0.010	<0.018	<0.021	<0.019	<0.016	<0.015
03/22/93	<0.008	<0.011	<0.013	<0.011	<0.012	<0.009
03/29/93	<0.012	<0.014	<0.011	<0.018	<0.014	<0.009
04/05/93	<0.010	<0.016	<0.014	<0.018	<0.014	<0.011
04/12/93	<0.014	<0.019	<0.013	<0.012	<0.013	<0.015
04/19/93	<0.018	<0.010	<0.014	<0.013	<0.012	<0.010
04/26/93	<0.018	<0.012	<0.012	<0.018	<0.012	<0.011
05/03/93	<0.010	<0.013	<0.010	<0.018	<0.010	<0.018
05/10/93	<0.010	<0.019	<0.012	<0.015	<0.012	<0.008
05/17/93	<0.014	<0.013	<0.009	<0.019	<0.015	<0.013
05/24/93	<0.012	<0.009	<0.019	<0.013	<0.016	<0.012
06/01/93	<0.011	<0.010	<0.011	<0.014	<0.020	<0.011
06/07/93	<0.016	<0.010	<0.024	<0.015	<0.010	<0.021
06/14/93	<0.022	<0.011	<0.022	<0.014	<0.014	<0.013
06/21/93	<0.008	<0.016	<0.015	<0.013	<0.018	<0.012
06/28/93	<0.013	<0.020	<0.011	<0.022	<0.010	<0.023

TABLE 6-8 (CONTINUED)

NMP/JAF SITE
ENVIRONMENTAL CHARCOAL CARTRIDGE SAMPLES - ON-SITE STATIONS
I-131 ACTIVITY pCi/m^3 ± 1 SIGMA
LOCATION

WEEK END	D1--ON	G--ON	H--ON	I--ON	J--ON	K--ON
07/06/93	<0.022	<0.013	<0.014	<0.013	<0.014	<0.015
07/12/93	<0.016	<0.017	<0.016	<0.016	<0.021	<0.012
07/19/93	<0.014	<0.016	<0.012	<0.014	<0.014	<0.015
07/26/93	<0.010	<0.019	<0.013	<0.016	<0.012	<0.013
08/02/93	<0.013	<0.015	<0.010	<0.015	<0.011	<0.018
08/09/93	<0.008	<0.020	<0.017	<0.019	<0.017	<0.020
08/16/93	<0.011	<0.017	<0.019	<0.016	<0.014	<0.015
08/23/93	<0.009	<0.018	<0.011	<0.022	<0.013	<0.012
08/30/93	<0.012	<0.016	<0.014	<0.023	<0.013	<0.012
09/07/93	<0.012	<0.012	<0.012	<0.019	<0.015	<0.015
09/13/93	<0.013	<0.013	<0.012	<0.023	<0.017	<0.010
09/20/93	<0.012	<0.013	<0.015	<0.016	<0.020	<0.013
09/27/93	<0.009	<0.013	<0.016	<0.012	<0.011	<0.012
10/04/93	<0.009	<0.013	<0.013	<0.014	<0.011	<0.011
10/11/93	<0.013	<0.015	<0.012	<0.016	<0.016	<0.014
10/18/93	<0.013	<0.016	<0.009	<0.010	<0.013	<0.010
10/25/93	<0.007	<0.012	<0.015	<0.016	<0.013	<0.009
11/01/93	<0.010	<0.010	<0.019	<0.012	<0.014	<0.016
11/08/93	<0.011	<0.011	<0.012	<0.018	<0.014	<0.014
11/15/93	<0.011	<0.009	<0.014	<0.019	<0.013	<0.013
11/22/93	<0.013	<0.017	<0.014	<0.021	<0.014	<0.018
11/29/93	<0.011	<0.013	<0.010	<0.012	<0.016	<0.010
12/06/93	<0.012	<0.016	<0.012	<0.015	<0.015	<0.013
12/11/93	<0.012	<0.016	<0.012	<0.015	<0.015	<0.013
12/20/93	<0.013	<0.015	<0.013	<0.015	<0.016	<0.014
12/27/93	<0.013	<0.015	<0.011	<0.013	<0.019	<0.012
01/03/94	<0.011	<0.013	<0.008	<0.013	<0.018	<0.010

TABLE 6-9

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			R1 OFF-SITE COMPOSITE*			
TlCe-144	<2.98	<6.06	<8.83	<7.07	<5.18	<5.44
Ce-141	<0.94	<1.71	<2.71	<2.58	<1.90	<1.84
Be-7	59.8±5.6	92.4±7.7	53.5±8.1	109±8	69.4±7.6	89.1±9.9
Zn-65	<3.12	<4.42	<6.95	<4.76	<4.67	<5.46
Cs-134	<1.39	<1.78	<2.74	<2.11	<1.51	<1.84
Cs-137	<0.76	<1.51	<1.71	<1.69	<1.04	<1.60
Zr-95	<2.17	<3.12	<4.18	<3.72	<3.93	<4.02
Nb-95	<1.77	<2.38	<2.25	<2.48	<2.55	<2.83
Co-58	<1.22	<1.65	<2.42	<2.01	<1.72	<2.69
Mn-54	<1.12	<1.57	<2.16	<1.73	<1.93	<2.06
Co-60	<1.15	<2.45	<2.44	<1.90	<1.99	<3.23
K-40	<13.7	16.0±7.8	239±15	209±12	54.0±7.8	<35.5
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R2 OFF-SITE COMPOSITE*			
TlCe-144	<4.62	<4.04	<4.95	<3.50	<9.79	<5.79
Ce-141	<1.81	<1.60	<1.74	<1.43	<3.29	<2.00
Be-7	72.8±7.5	86.6±8.4	73.1±7.6	95.9±7.2	82.9±8.9	106±11
Zn-65	<4.13	<3.92	<4.03	<4.28	<7.40	<7.14
Cs-134	<1.51	<1.90	<1.53	<1.24	<2.77	<1.98
Cs-137	<1.31	<1.43	<1.65	<1.17	<1.97	<1.75
Zr-95	<2.85	<3.08	<2.81	<2.84	<4.65	<3.74
Nb-95	<1.72	<1.59	<1.79	<1.63	<3.09	<3.25
Co-58	<1.87	<1.53	<1.71	<1.22	<2.90	<2.18
Mn-54	<1.92	<1.28	<1.21	<1.03	<2.24	<2.27
Co-60	<1.85	<2.02	<2.25	<1.66	<2.03	<3.66
K-40	<25.6	<26.0	15.7±6.9	9.46±4.85	267±16.5	36.7±9.1
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			R3 OFF-SITE COMPOSITE*			
TlCe-144	<3.96	<8.02	<4.32	<4.70	<5.12	<5.30
Ce-141	<1.24	<2.53	<1.48	<1.55	<1.76	<1.86
Be-7	68.9±6.1	73.2±8.0	76.7±7.2	85.2±6.9	68.0±7.6	84.0±8.7
Zn-65	<2.47	<5.89	<3.80	<4.37	<4.16	<4.63
Cs-134	<0.88	<2.57	<1.57	<1.16	<1.19	<2.17
Cs-137	<1.07	<1.75	<1.62	<1.04	<1.46	<1.93
Zr-95	<2.35	<3.64	<2.85	<2.58	<2.87	<5.02
Nb-95	<1.47	<2.04	<1.91	<1.45	<2.07	<3.15
Co-58	<1.19	<2.45	<1.98	<1.49	<1.35	<2.24
Mn-54	<1.26	<1.97	<1.98	<1.46	<1.47	<2.27
Co-60	<1.55	<2.50	<1.47	<0.98	<1.66	<3.50
K-40	10.7±4.2	210±13	<19.7	30.6±5.9	<20.8	52.1±10.9
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R4 OFF-SITE COMPOSITE*			
TlCe-144	<3.73	<5.55	<4.35	<3.64	<4.27	<8.99
Ce-141	<1.22	<1.51	<1.70	<1.34	<1.50	<3.25
Be-7	53.8±5.7	73.4±7.3	70.7±7.4	83.7±7.2	58.6±7.3	76.5±8.7
Zn-65	<2.94	<3.92	<3.69	<2.57	<3.01	<6.02
Cs-134	<1.27	<1.36	<1.42	<1.19	<1.36	<2.45
Cs-137	<1.03	<1.48	<1.35	<1.05	<1.42	<2.12
Zr-95	<2.48	<3.10	<2.95	<2.19	<1.75	<3.56
Nb-95	<1.82	<2.01	<1.72	<1.66	<1.62	<2.83
Co-58	<1.87	<1.90	<1.86	<1.45	<1.96	<2.37
Mn-54	<1.08	<2.14	<1.61	<0.88	<1.80	<2.12
Co-60	<2.25	<1.58	<1.84	<1.49	<1.72	<2.10
K-40	<17.7	17.3±7.2	<20.5	<17.9	<3.53	239±14.7
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			R5 OFF-SITE COMPOSITE (CONTROL)*			
TlCe-144	<3.04	<3.65	<4.31	<6.66	<5.09	<4.72
Ce-141	<1.18	<1.13	<1.43	<2.47	<1.64	<1.78
Be-7	43.9±5.4	65.6±6.8	85.7±7.2	97.4±7.5	70.5±6.9	89.7±7.6
Zn-65	<2.92	<3.30	<2.77	<4.64	<4.35	<4.82
Cs-134	<0.99	<1.49	<1.23	<1.97	<1.27	<1.55
Cs-137	<0.79	<1.17	<1.24	<1.41	<1.27	<1.43
Zr-95	<2.21	<2.19	<2.25	<3.59	<3.15	<3.31
Nb-95	<1.86	<1.56	<1.92	<2.21	<2.03	<2.23
Co-58	<1.63	<1.29	<1.44	<1.97	<1.78	<1.38
Mn-54	<1.14	<1.45	<1.14	<1.56	<1.75	<1.98
Co-60	<1.75	<1.51	<1.59	<1.49	<1.56	<1.61
K-40	27.5±6.1	<13.2	12.6±5.0	184±11	43.5±7.6	43.7±8.3
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			D2 OFF-SITE COMPOSITE**			
TlCe-144	<3.57	<8.02	<4.22	<3.64	<9.64	<4.89
Ce-141	<1.23	<2.46	<1.58	<1.58	<2.93	<1.57
Be-7	50.7±5.3	81.5±7.4	73.9±7.3	97.3±7.4	95.5±8.2	96.0±8.9
Zn-65	<2.14	<5.51	<3.75	<3.14	<7.15	<4.42
Cs-134	<0.97	<2.46	<1.66	<0.98	<2.77	<1.63
Cs-137	<0.93	<1.76	<1.36	<1.24	<2.35	<1.35
Zr-95	<1.76	<3.57	<2.93	<2.76	<4.40	<3.02
Nb-95	<1.23	<2.31	<1.89	<1.79	<2.82	<2.04
Co-58	<1.09	<2.02	<2.10	<1.03	<2.88	<1.81
Mn-54	<1.19	<1.84	<1.71	<1.59	<2.35	<1.57
Co-60	<1.79	<2.27	<1.45	<1.46	<2.70	<2.13
K-40	<7.82	216+14	<11.4	12.9±4.9	251±15.5	24.3±7.1
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required by Technical Specifications.
** Optional Sample Location. Not Required By the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			E OFF-SITE COMPOSITE**			
TlCe-144	<3.63	<8.02	<9.07	<4.13	<4.60	8.61
Ce-141	<1.35	<2.63	<3.40	<1.76	<1.36	<3.34
Be-7	60.7±5.4	92.6±8.0	87.3±9.4	94.5±7.0	91.0±7.6	102±9.2
Zn-65	<2.93	<6.17	<6.50	<3.54	<4.07	<6.29
Cs-134	<1.13	<2.18	<2.61	<1.06	<1.47	<2.52
Cs-137	<0.84	<2.01	<2.06	<1.02	<1.46	<1.85
Zr-95	<2.20	<3.72	<4.03	<2.33	<3.06	<4.36
Nb-95	<1.30	<2.31	<3.02	<1.68	<1.89	<3.06
Co-58	<0.87	<2.18	<2.56	<1.59	<1.57	<2.42
Mn-54	<1.18	<2.05	<2.04	<1.39	<1.56	<2.38
Co-60	<1.37	<1.61	<2.01	<1.37	<2.00	<2.28
K-40	15.0±4.2	216±14	233±14	36.1±6.4	<20.3	231±15.1
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			F OFF-SITE COMPOSITE**			
TlCe-144	<4.40	<4.40	<3.99	<3.16	<4.84	<7.87
Ce-141	<1.58	<1.26	<1.31	<1.34	<1.61	<2.88
Be-7	61.1±6.0	96.3±7.5	68.8±6.2	110±8.0	72.2±7.2	93.5±8.8
Zn-65	<3.11	<2.54	<3.53	<2.75	<3.17	<5.89
Cs-134	<1.12	<1.21	<1.22	<0.95	<1.17	<2.31
Cs-137	<0.98	<1.36	<1.38	<0.98	<1.14	<1.96
Zr-95	<2.73	<2.86	<2.76	<1.61	<3.01	<3.71
Nb-95	<2.06	<1.77	<1.65	<1.28	<1.84	<2.75
Co-58	<1.46	<1.31	<0.98	<1.59	<1.22	<2.17
Mn-54	<1.40	<1.42	<1.30	<1.15	<1.53	<1.90
Co-60	<1.46	<1.21	<1.74	<0.82	<1.44	<2.00
K-40	21.5±5.4	<12.3	<16.0	11.2±4.1	28.3±6.6	216±13.7
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			G OFF-SITE COMPOSITE**			
TlCe-144	<2.97	<5.18	<7.28	<6.23	<8.06	<8.12
Ce-141	<1.07	<1.62	<2.37	<2.34	<2.69	<2.95
Be-7	58.1±5.4	73.6±7.1	61.8±6.9	94.1±6.9	60.8±7.7	91.8±8.7
Zn-65	<3.30	<1.78	<5.82	<4.73	<6.13	<6.61
Cs-134	<1.02	<1.46	<2.34	<1.90	<2.42	<2.17
Cs-137	<0.68	<1.28	<1.64	<1.48	<1.91	<1.83
Zr-95	<2.18	<2.82	<3.38	<2.88	<4.52	<4.02
Nb-95	<1.44	<2.41	<2.50	<2.21	<2.85	<2.76
Co-58	<1.22	<1.57	<1.93	<1.76	<2.37	<2.24
Mn-54	<1.14	<1.71	<1.92	<1.46	<1.64	<1.88
Co-60	<1.18	<1.46	<1.97	<1.99	<2.09	<2.11
K-40	<14.7	30.9±6.2	205±13	166±10	222±14	186±13
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			D1 ON-SITE COMPOSITE**			
TlCe-144	<3.81	<4.42	<4.96	<4.04	<4.49	<5.70
Ce-141	<1.39	<1.29	<1.80	<1.52	<1.61	<2.02
Be-7	55.1±5.7	102±8.0	81.5±7.6	96.1±7.2	76.0±7.0	94.9±11.0
Zn-65	<3.46	<3.94	<3.70	<3.30	<2.55	<8.05
Cs-134	<1.20	<1.29	<1.26	<1.12	<1.43	<2.21
Cs-137	<1.13	<1.30	<1.38	<0.98	<1.38	<1.71
Zr-95	<2.44	<3.07	<2.60	<2.39	<2.73	<5.23
Nb-95	<1.70	<1.72	<2.19	<1.52	<1.92	<3.08
Co-58	<1.68	<1.16	<1.71	<1.26	<1.53	<1.75
Mn-54	<1.52	<1.57	<1.49	<1.51	<1.43	<2.33
Co-60	<1.47	<1.78	<2.00	<1.45	<1.38	<2.89
K-40	23.1±6.7	<16.0	46.1±7.9	7.50±4.6	<20.3	20.3±8.4
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			G ON-SITE COMPOSITE**			
TlCe-144	<2.94	<4.13	<3.88	<4.05	<8.58	<5.27
Ce-141	<1.03	<1.28	<1.92	<1.58	<2.56	<1.67
Be-7	73.5±5.8	78.6±7.2	72.8±7.1	96.3±7.2	74.4±7.5	100±8.1
Zn-65	<3.21	<3.73	<3.39	<3.87	<6.17	<3.86
Cs-134	<1.08	<1.52	<1.14	<1.17	<2.41	<1.35
Cs-137	<0.80	<1.15	<1.41	<1.05	<1.97	<1.50
Zr-95	<1.87	<2.77	<2.92	<2.41	<3.83	<2.71
Nb-95	<1.43	<1.66	<2.10	<1.92	<2.61	<2.07
Co-58	<0.90	<1.17	<1.39	<1.59	<2.10	<1.58
Mn-54	<1.05	<1.40	<1.54	<1.30	<1.88	<1.31
Co-60	<1.07	<1.07	<1.97	<1.24	<2.07	<2.45
K-40	<12.8	<16.4	<16.8	35.3±6.5	218±13.8	<18.4
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			H ON-SITE COMPOSITE**			
TlCe-144	<3.12	<4.59	<4.29	<7.69	<4.81	<6.06
Ce-141	<1.03	<1.36	<1.76	<2.76	<1.61	<1.89
Be-7	49.5±5.9	59.6±6.6	84.7±8.7	111±8.6	67.7±7.2	56.1±6.9
Zn-65	<2.90	<3.85	<3.55	<5.50	<3.98	<2.73
Cs-134	<1.11	<1.33	<1.43	<2.26	<1.45	<1.52
Cs-137	<1.17	<1.38	<1.39	<1.78	<1.42	<1.41
Zr-95	<1.86	<2.75	<3.15	<4.29	<2.63	<3.71
Nb-95	<1.54	<1.72	<2.17	<2.82	<1.44	<2.03
Co-58	<1.50	<1.86	<1.86	<2.04	<1.69	<1.60
Mn-54	<1.31	<0.98	<1.52	<1.83	<1.61	<1.93
Co-60	<1.20	<1.62	<1.20	<1.91	<1.88	<1.46
K-40	8.54±4.8	<18.5	13.2±5.9	202±12.3	<19.0	<19.6
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			I ON-SITE COMPOSITE**			
TlCe-144	<4.11	<5.40	<4.60	<7.17	<5.03	<5.93
Ce-141	<1.48	<1.95	<1.88	<2.73	<1.73	<1.94
Be-7	54.7±5.9	67.5±6.8	59.7±7.7	102±8.1	61.1±6.1	97.9±8.0
Zn-65	<2.67	<3.57	<3.95	<4.72	<3.11	<4.17
Cs-134	<1.21	<1.51	<1.61	<1.94	<1.27	<1.50
Cs-137	<0.97	<1.44	<1.50	<1.67	<1.21	<1.14
Zr-95	<1.76	<4.17	<3.21	<3.37	<3.38	<3.13
Nb-95	<1.43	<2.11	<1.52	<2.80	<2.19	<2.46
Co-58	<2.15	<1.70	<1.70	<1.91	<2.08	<2.07
Mn-54	<1.74	<1.62	<1.46	<1.78	<1.47	<1.47
Co-60	<2.16	<2.02	<1.82	<1.70	<1.24	<2.27
K-40	19.1±6.3	37.5±7.4	17.1±6.2	198±12.4	50.7±8.8	42.4±8.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

NUCLIDES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
			J ON-SITE COMPOSITE**			
TlCe-144	<2.40	<4.81	<4.67	<4.46	<4.48	<4.53
Ce-141	<0.92	<1.43	<1.50	<1.55	<1.71	<1.41
Be-7	44.0±5.5	68.7±7.2	65.6±7.7	78.0±7.0	49.4±4.7	72.7±7.9
Zn-65	<2.88	<3.60	<4.76	<3.44	<3.20	<4.35
Cs-134	<1.10	<1.34	<1.36	<1.33	<1.45	<1.39
Cs-137	<0.89	<1.37	<1.41	<1.06	<1.42	<1.09
Zr-95	<1.85	<3.06	<3.63	<2.89	<2.66	<2.54
Nb-95	<1.53	<1.99	<2.25	<1.67	<2.03	<1.81
Co-58	<1.33	<1.59	<1.97	<1.31	<2.03	<1.58
Mn-54	<1.01	<0.94	<1.71	<1.31	<1.52	<1.63
Co-60	<1.57	<1.99	<1.51	<1.35	<1.22	<1.99
K-40	<12.2	19.3±5.9	<25.6	<1.36	<19.2	16.7±6.5
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			K ON-SITE COMPOSITE**			
TlCe-144	<3.09	<4.65	<7.69	<3.58	<7.97	<5.28
Ce-141	<1.19	<1.47	<2.67	<1.35	<2.60	<1.91
Be-7	47.0±5.3	63.4±6.5	78.9±7.3	90.3±6.4	60.5±7.4	72.9±7.8
Zn-65	<3.10	<4.20	<5.44	<3.38	<6.04	<4.94
Cs-134	<1.05	<1.52	<2.26	<0.94	<2.52	<1.50
Cs-137	<1.07	<1.26	<1.85	<1.05	<1.73	<1.47
Zr-95	<2.42	<2.83	<3.76	<1.88	<3.80	<3.66
Nb-95	<1.47	<2.02	<2.70	<1.57	<2.71	<2.13
Co-58	<1.53	<1.66	<1.82	<1.30	<2.20	<1.78
Mn-54	<0.93	<1.56	<1.66	<1.24	<1.73	<1.66
Co-60	<1.11	<2.19	<2.12	<1.26	<1.99	<2.09
K-40	19.3±5.1	10.4±5.6	189±13	34.7±5.6	194±13.1	47.6±7.2
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			R1 OFF-SITE COMPOSITE*			
TlCe-144	<4.29	<4.95	<4.67	<4.17	<4.80	<3.95
Ce-141	<1.62	<1.78	<1.87	<1.29	<1.77	<1.63
Be-7	74.0±6.6	85.5±8.3	94.2±8.7	88.1±6.5	79.5±7.3	59.4±6.7
Zn-65	<3.76	<3.68	<4.15	<2.68	<5.53	<2.94
Cs-134	<1.16	<1.40	<1.52	<1.25	<1.55	<1.20
Cs-137	<1.20	<1.20	<1.36	<1.20	<1.45	<0.89
Zr-95	<2.83	<3.20	<2.83	<2.40	<2.56	<1.53
Nb-95	<1.71	<2.55	<2.32	<1.86	<2.38	<1.89
Co-58	<1.44	<1.53	<1.35	<1.27	<1.57	<1.52
Mn-54	<1.27	<1.55	<1.33	<1.41	<1.22	<1.34
Co-60	<1.40	<1.96	<1.72	<2.07	<2.43	<1.55
K-40	27.6±6.3	<26.7	<26.5	<11.8	93.2±5.4	14.1±4.9
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R2 OFF-SITE COMPOSITE*			
TlCe-144	<3.99	<5.50	<4.66	<3.80	<4.13	<5.17
Ce-141	<1.37	<2.03	<1.63	<1.45	<1.44	<4.19
Be-7	87.2±7.6	79.6±7.9	85.3±8.1	74.9±6.4	73.2±7.2	66.5±6.0
Zn-65	<3.47	<3.59	<3.65	<3.11	<3.46	<2.60
Cs-134	<1.41	<1.54	<1.50	<1.07	<1.42	<0.98
Cs-137	<1.55	<1.25	<1.32	<1.05	<1.47	<1.18
Zr-95	<1.95	<3.86	<2.73	<2.73	<2.54	<2.73
Nb-95	<1.39	<2.18	<2.24	<1.67	<1.69	<1.99
Co-58	<1.39	<2.30	<2.15	<1.36	<1.80	<1.49
Mn-54	<1.31	<1.95	<1.57	<1.31	<1.63	<1.26
Co-60	<1.94	<1.74	<1.55	<1.60	<2.20	<1.92
K-40	<10.6	36.7±8.2	46.3±7.8	36.1±6.2	14.7±5.5	47.1±6.5
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3} pCi/m^3 ± 2 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			R3 OFF-SITE COMPOSITE*			
TlCe-144	<4.36	<9.34	<4.60	<3.58	<5.17	<3.78
Ce-141	<1.50	<3.33	<2.04	<1.28	<1.85	<1.30
Be-7	70.0±8.2	91.4±9.6	75.1±5.6	80.1±7.5	78.2±7.7	75.6±7.2
Zn-65	<4.47	<6.75	<3.90	<3.28	<5.40	<2.62
Cs-134	<1.47	<2.71	<1.51	<1.05	<1.74	<1.38
Cs-137	<1.31	<2.27	<1.68	<1.06	<1.35	<1.01
Zr-95	<3.61	<4.94	<4.11	<2.85	<3.33	<2.96
Nb-95	<2.50	<2.90	<1.83	<1.58	<1.64	<2.35
Co-58	<1.81	<2.69	<1.72	<1.57	<1.60	<1.16
Mn-54	<1.93	<2.52	<1.72	<1.55	<1.66	<1.67
Co-60	<1.40	<2.38	<1.93	<1.67	<1.29	<1.48
K-40	<27.0	225±14.8	11.9±4.6	<10.0	38.3±8.3	<15.0
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			R4 OFF-SITE COMPOSITE*			
TlCe-144	<4.23	<4.17	<5.13	<4.06	<5.03	<4.02
Ce-141	<1.45	<1.73	<2.06	<1.39	<1.65	<1.65
Be-7	65.8±6.1	86.7±8.5	92.1±8.5	61.2±5.9	74.6±7.2	60.9±6.6
Zn-65	<3.20	<2.44	<5.13	<2.57	<3.09	<2.10
Cs-134	<1.34	<1.43	<1.43	<0.88	<1.39	<1.12
Cs-137	<1.14	<1.54	<1.53	<1.21	<1.17	<0.91
Zr-95	<2.60	<2.28	<3.91	<2.64	<3.19	<2.03
Nb-95	<1.54	<2.13	<2.25	<1.72	<2.27	<1.55
Co-58	<1.51	<2.26	<1.90	<1.67	<1.80	<1.25
Mn-54	<1.29	<1.31	<1.56	<1.06	<1.63	<1.11
Co-60	<1.37	<2.41	<2.42	<1.68	<2.28	<1.35
K-40	36.3±7.0	<24.5	31.1±7.3	25.4±6.2	52.1±8.6	28.6±6.1
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required by Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			R5 OFF-SITE COMPOSITE (CONTROL)*			
TlCe-144	<4.21	<3.76	<5.03	<5.74	<4.11	<3.67
Ce-141	<1.43	<1.62	<1.79	<1.96	<1.44	<1.41
Be-7	76.6±6.7	85.1±8.6	74.4±7.2	77.6±6.4	69.5±7.3	60.7±6.0
Zn-65	<2.97	<3.48	<3.14	<3.96	<2.32	<2.04
Cs-134	<1.02	<1.49	<1.20	<1.49	<1.33	<1.10
Cs-137	<1.26	<1.11	<1.15	<1.29	<1.63	<0.82
Zr-95	<2.19	<2.61	<2.47	<2.87	<2.73	<2.11
Nb-95	<1.31	<2.29	<1.89	<1.89	<1.99	<1.81
Co-58	<1.59	<1.73	<1.02	<1.72	<1.30	<1.22
Mn-54	<1.27	<1.75	<1.43	<1.59	<1.74	<1.14
Co-60	<1.12	<2.03	<1.97	<1.58	<2.60	<1.27
K-40	15.5±4.3	19.1±6.3	<13.7	139±9.7	10.5±5.2	<17.2
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			D2 OFF-SITE COMPOSITE**			
TlCe-144	<3.50	<5.31	<5.67	<4.47	<8.06	<4.28
Ce-141	<1.33	<2.06	<2.06	<1.45	<2.64	<1.79
Be-7	86.0±7.3	91.2±9.0	73.8±8.0	79.5±7.0	65.0±7.8	69.5±6.8
Zn-65	<2.38	<3.51	<4.12	<2.91	<2.38	<3.66
Cs-134	<1.46	<1.26	<1.34	<1.02	<1.92	<1.34
Cs-137	<1.18	<1.29	<1.56	<1.21	<1.77	<1.06
Zr-95	<1.73	<2.49	<3.68	<2.42	<3.88	<3.03
Nb-95	<1.44	<1.50	<3.30	<1.87	<2.53	<2.37
Co-58	<1.93	<1.24	<1.79	<1.68	<2.84	<1.61
Mn-54	<1.26	<1.37	<1.59	<1.28	<2.01	<1.28
Co-60	<1.30	<1.56	<2.80	<1.70	<1.90	<1.90
K-40	<17.4	30.5±7.5	42.2±9.0	9.90±4.4	192±13.6	26.2±7.4
Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Sample Locations Required by Technical Specifications.
** Optional Sample Location. Not Required By the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			E OFF-SITE COMPOSITE**			
TlCe-144	<4.40	<5.22	<4.55	<3.95	<4.41	<3.51
Ce-141	<1.38	<1.82	<1.77	<1.38	<1.57	<1.30
Be-7	76.0±7.9	125±10.4	105±8.5	79.8±6.2	68.6±7.0	68.7±6.8
Zn-65	<4.87	<3.74	<4.41	<3.35	<3.97	<2.71
Cs-134	<1.69	<1.85	<1.63	<1.11	<1.55	<1.32
Cs-137	<1.07	<1.48	<1.33	<1.23	<1.29	<1.00
Zr-95	<2.81	<2.55	<2.30	<2.65	<3.20	<1.82
Nb-95	<2.22	<2.49	<1.91	<1.77	<2.14	<1.61
Co-58	<2.04	<2.14	<2.42	<1.45	<1.20	<1.20
Mn-54	<2.08	<2.10	<1.94	<0.84	<1.21	<1.24
Co-60	<2.33	<1.64	<2.01	<0.99	<1.58	<1.19
K-40	<21.1	<3.93	17.5±6.4	32.7±6.1	<19.8	12.2±4.1
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			F OFF-SITE COMPOSITE**			
TlCe-144	<3.50	<4.57	<3.87	<3.27	<4.63	<3.42
Ce-141	<1.33	<1.96	<1.46	<1.03	<1.60	<1.44
Be-7	71.7±6.1	87.4±7.6	96.8±8.2	69.3±6.1	68.2±7.0	60.3±6.1
Zn-65	<3.63	<3.87	<3.56	<2.77	<1.45	<3.74
Cs-134	<0.89	<1.22	<1.38	<1.08	<1.19	<0.94
Cs-137	<0.96	<1.23	<1.28	<1.03	<1.20	<0.96
Zr-95	<1.84	<3.02	<2.06	<1.80	<2.75	<2.42
Nb-95	<1.28	<2.40	<1.72	<1.27	<1.96	<1.81
Co-58	<1.19	<1.26	<1.82	<1.04	<1.71	<1.58
Mn-54	<1.18	<1.60	<1.41	<1.21	<1.40	<1.18
Co-60	<1.57	<1.79	<1.60	<1.55	<1.82	<1.45
K-40	<7.77	8.90±4.8	<13.9	<8.46	40.6±7.2	9.19±4.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3}pCi/m^3 ± 1 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			G OFF-SITE COMPOSITE**			
TlCe-144	<3.51	<8.29	<4.99	<3.61	<7.24	<3.42
Ce-141	<1.22	<3.12	<1.80	<1.26	<2.55	<1.54
Be-7	78.3±5.9	79.2±8.3	70.5±66.6	59.9±5.4	56.8±7.3	5.82±5.4
Zn-65	<2.65	<5.70	<3.26	<2.67	<5.47	<2.84
Cs-134	<1.05	<2.15	<1.17	<1.01	<1.67	<1.14
Cs-137	<0.81	<1.84	<1.19	<0.78	<1.68	<0.100
Zr-95	<1.65	<3.90	<2.58	<2.06	<3.91	<2.05
Nb-95	<1.30	<3.01	<1.93	<1.24	<2.67	<1.66
Co-58	<1.46	<2.50	<2.08	<1.13	<2.26	<1.46
Mn-54	<1.17	<1.98	<1.48	<0.95	<1.89	<0.86
Co-60	<1.32	<2.24	<1.97	<0.77	<1.88	<1.68
K-40	6.04±3.5	216±14.1	47.5±7.1	34.0±5.7	168±12.3	29.3±5.8
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993

Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			D1 ON-SITE COMPOSITE**			
TlCe-144	<3.54	<3.40	<4.52	<3.54	<4.42	<3.93
Ce-141	<1.29	<1.46	<1.70	<1.20	<1.38	<1.71
Be-7	86.9±6.2	99.3±7.9	76.0±6.8	72.4±5.6	69.0±6.6	73.2±6.9
Zn-65	<2.83	<3.73	<3.50	<3.21	<2.46	<1.82
Cs-134	<0.75	<1.41	<1.02	<1.03	<0.97	<1.08
Cs-137	<1.23	<1.32	<0.97	<1.21	<1.11	<0.69
Zr-95	<2.29	<1.91	<1.90	<1.96	<2.45	<2.38
Nb-95	<1.41	<1.78	<1.22	<1.45	<1.47	<1.93
Co-58	<1.28	<2.13	<1.31	<1.10	<1.58	<1.08
Mn-54	<1.12	<1.18	<0.95	<0.83	<1.16	<1.21
Co-60	<1.55	<1.52	<1.44	<1.45	<1.21	<1.80
K-40	<18.2	11.1±5.4	34.9±6.9	<12.4	22.6±7.1	34.6±6.7
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			G ON-SITE COMPOSITE**			
TlCe-144	<4.37	<8.80	<5.00	<3.85	<6.48	<3.89
Ce-141	<1.37	<2.95	<1.61	<1.33	<2.19	<1.35
Be-7	62.5±7.7	104±8.6	72.1±7.4	66.7±6.0	60.1±6.5	65.8±6.6
Zn-65	<4.70	<6.78	<4.51	<3.36	<3.91	<1.59
Cs-134	<1.33	<2.73	<1.27	<1.21	<1.70	<1.36
Cs-137	<1.46	<2.07	<1.11	<0.87	<1.38	<1.26
Zr-95	<3.51	<4.83	<2.44	<2.60	<2.93	<1.62
Nb-95	<1.69	<3.34	<1.92	<1.82	<2.02	<0.99
Co-58	<1.79	<2.25	<1.42	<1.43	<2.08	<1.66
Mn-54	<1.65	<2.26	<1.34	<1.34	<1.57	<1.57
Co-60	<2.45	<2.19	<1.84	<1.37	<2.01	<1.93
K-40	27.7±6.8	214±14.2	42.3±9.0	51.3±7.3	180±11.4	<12.9
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3} pCi/m^3 ± 1 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			H ON-SITE COMPOSITE**			
TlCe-144	<4.07	<5.60	<5.49	<4.51	<4.62	<4.19
Ce-141	<1.52	<1.70	<2.08	<1.41	<1.66	<1.47
Be-7	82.6±6.5	67.4±7.9	82.3±7.9	74.4±6.3	69.3±7.0	62.5±6.3
Zn-65	<3.38	<4.77	<3.34	<3.83	<4.86	<2.15
Cs-134	<1.14	<1.45	<1.51	<1.16	<1.60	<1.20
Cs-137	<1.11	<1.42	<1.49	<0.91	<1.48	<1.24
Zr-95	<2.63	<3.06	<2.47	<2.21	<2.76	<2.80
Nb-95	<1.70	<1.98	<2.14	<1.53	<1.45	<2.04
Co-58	<1.58	<1.78	<1.53	<1.65	<1.68	<1.44
Mn-54	<1.14	<1.85	<1.55	<1.00	<1.58	<0.97
Co-60	<1.50	<1.47	<2.33	<1.52	<1.64	<1.33
K-40	23.6±6.37	<21.7	23.3±8.0	18.2±5.6	19.4±6.4	<16.7
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			I ON-SITE COMPOSITE**			
TlCe-144	<7.37	<4.89	<5.09	<3.85	<5.43	<3.97
Ce-141	<2.48	<1.92	<1.98	<1.38	<2.00	<1.44
Be-7	75.4±4.3	69.1±6.9	81.6±7.7	72.2±6.5	57.0±7.0	60.2±5.6
Zn-65	<5.34	<5.13	<3.36	<3.35	<3.77	<3.05
Cs-134	<1.90	<1.34	<1.31	<1.31	<1.53	<0.93
Cs-137	<1.67	<1.35	<1.33	<1.21	<1.27	<0.89
Zr-95	<3.66	<3.62	<2.76	<2.60	<3.70	<1.71
Nb-95	<2.88	<2.31	<2.30	<1.67	<2.14	<1.68
Co-58	<2.16	<1.71	<1.95	<1.35	<1.91	<1.51
Mn-54	<1.87	<1.55	<1.25	<1.33	<1.66	<1.19
Co-60	<2.08	<2.29	<1.76	<1.13	<2.02	<1.64
K-40	190±7.1	52.8±9.0	37.0±8.5	16.6±4.4	55.4±8.8	45.6±6.2
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-9 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MONTHLY COMPOSITES
OF JAF/NMP SITE AIR PARTICULATE SAMPLES - 1993
Results in Units of 10^{-3} pCi/m^3 ± 2 Sigma

NUCLIDES	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
			J ON-SITE COMPOSITE**			
TlCe-144	<3.88	<4.38	<4.82	<4.53	<5.12	<3.51
Ce-141	<1.31	<1.62	<1.92	<1.59	<1.58	<1.27
Be-7	75.8±6.7	72.8±7.6	74.1±8.3	78.3±6.8	76.5±7.8	65.2±6.2
Zn-65	<3.13	<3.94	<4.82	<4.31	<3.49	<2.78
Cs-134	<1.56	<1.54	<1.74	<1.39	<1.66	<1.06
Cs-137	<1.21	<1.57	<1.44	<1.10	<1.18	<0.99
Zr-95	<2.40	<2.57	<3.06	<3.04	<3.28	<1.56
Nb-95	<1.75	<2.32	<2.01	<2.11	<2.44	<1.19
Co-58	<2.05	<1.58	<2.41	<1.81	<2.10	<1.31
Mn-54	<0.98	<1.48	<1.97	<1.61	<1.76	<1.10
Co-60	<1.87	<2.14	<1.95	<1.06	<2.04	<1.18
K-40	<21.9	<25.7	13.9±6.7	36.4±6.4	16.5±6.3	<13.4
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
			K ON-SITE COMPOSITE**			
TlCe-144	<4.02	<7.95	<4.50	<3.50	<4.56	<3.87
Ce-141	<1.20	<2.84	<1.61	<1.25	<1.57	<1.68
Be-7	78.5±7.5	90.1±8.5	71.4±7.3	59.4±5.2	49.4±6.1	68.3±6.4
Zn-65	<4.89	<6.56	<3.34	<3.55	<4.11	<3.41
Cs-134	<1.38	<2.38	<1.20	<1.10	<1.13	<1.18
Cs-137	<1.25	<1.84	<1.32	<0.92	<1.32	<0.90
Zr-95	<3.05	<4.08	<2.89	<2.40	<2.59	<2.71
Nb-95	<2.55	<2.78	<2.22	<1.21	<1.75	<1.67
Co-58	<2.22	<2.20	<1.55	<1.12	<1.97	<1.66
Mn-54	<1.31	<2.02	<1.19	<1.07	<1.03	<1.49
Co-60	<2.50	<1.88	<1.65	<1.21	<1.55	<1.25
K-40	21.5±6.8	232±13.8	7.66±4.1	18.0±5.1	39.6±7.2	43.0±6.6
Otherst	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

** Optional Sample Location. Not Required by the Technical Specifications.
† Plant Related Radionuclides.

TABLE 6-10

DIRECT RADIATION MEASUREMENT RESULTS (1993)

Results in Units of mrem/std. Month ± 1 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
3	D1 On-site	7.6±1.0	10.9±1.0	13.6±1.1	12.5±1.6†	0.2 miles @ 69°
4	D2 On-site	4.6±0.7	4.4±0.2	7.1±3.2	5.2±0.5†	0.4 miles @ 140°
5	E On-site	4.3±0.6	4.6±0.2	5.9±0.9	4.0±0.4†	0.4 miles @ 175°
6	F On-site	3.4±0.1	3.5±0.3	5.8±0.6	4.0±0.6†	0.5 miles @ 210°
7*	G On-site	3.6±0.3	3.3±0.2	4.9±0.4	3.5±0.7†	0.7 miles @ 250°
8	R-5 Off-site Control	4.4±0.3	4.4±0.1	5.7±0.2	4.9±0.6†	16.4 miles @ 42°
9	D1 Off-Site	3.9±0.2	3.7±0.4	5.2±0.4	4.4±0.4†	11.4 miles @ 80°
10	D2 Off-site	3.4±0.2	3.2±0.2	5.2±0.4	4.2±0.5†	9.0 miles @ 117°
11	E Off-site	3.5±0.2	3.3±0.2	4.7±0.3	4.4±0.8†	7.2 miles @ 160°
12	F Off-site	3.8±0.2	3.5±0.1	5.6±0.2	4.3±0.6†	7.7 miles @ 190°
13	G Off-site	4.4±0.4	4.2±0.5	5.4±0.3	4.4±0.5†	5.3 miles @ 225°
14*	DeMass Rd., SW Oswego-Control	4.2±0.5	4.3±0.3	5.3±0.3	4.7±1.0†	12.6 miles @ 226°
15*	Pole 66, W. Boundary-Bible Camp	4.2±0.3	3.2±0.1	5.3±0.5	3.9±0.4†	0.9 miles @ 237°
18*	Energy Info. Center-Lamp Post, SW	4.1±0.4	3.9±0.2	5.2±0.3	4.6±0.9†	0.4 miles @ 265°
19	East Boundary-JAF, Pole 9	4.4±0.2	3.9±0.4	5.9±0.3	4.7±0.5†	1.3 miles @ 81°
23*	H On-site	3.9±0.4	4.2±0.2	6.5±0.8	5.2±0.6	0.8 miles @ 70°
24	I On-site	3.8±0.5	3.8±0.7	5.8±0.6	3.9±0.5	0.8 miles @ 98°
25	J On-site	3.1±0.5	3.5±0.2	4.6±0.3	3.8±0.4	0.9 miles @ 110°
26	K On-site	3.8±0.3	4.0±0.6	5.7±0.9	3.5±0.5	0.5 miles @ 132°
27	N. Fence, N. of Switchyard, JAF	11.1±1.2	16.9±2.3	21.1±2.5	16.3±2.3	0.4 miles @ 60°
28	N. Light Pole, N. of Screenhouse, JAF	17.2±4.0	21.6±4.7	33.7±7.6	24.1±5.0	0.5 miles @ 68°
29	N. Fence, N. of W. Side	14.1±2.9	19.7±4.4	27.6±6.0	20.5±4.1	0.5 miles @ 65°
30	N. Fence (NW) JAF	8.9±0.9	13.5±1.5	17.8±2.0	12.6±1.3	0.4 miles @ 57°
31	N. Fence (NW) NMP-1	7.1±0.8	5.8±0.4	8.2±0.9	6.6±0.8	0.2 miles @ 276°
39	N. Fence, Rad. Waste-NMP-1	9.2±1.5	8.6±1.0	9.9±1.0	8.7±1.0	0.2 miles @ 292°
47	N. Fence, (NE) JAF	5.3±0.7	5.5±0.9	7.3±0.8	6.2±0.8	0.6 miles @ 69°
49*	Phoenix, NY-Control	4.0±0.4	3.4±0.1	5.3±0.5	3.6±0.3	19.8 miles @ 170°
51	Liberty & Bronson Sts., E of OSS	4.5±0.5	3.9±0.3	5.1±0.5	4.8±0.3	7.4 miles @ 170°
52	East 12th & Cayuga Sts., Oswego School	4.3±0.2	3.4±0.1	5.0±0.3	3.9±0.3	5.8 miles @ 227°

TABLE 6-10 (CONTINUED)

DIRECT RADIATION MEASUREMENT RESULTS (1993)
Results in Units of mrem/std. Month ± 1 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
53	Broadwell & Chestnut Sts. - Fulton H.S.	3.9±0.1	4.3±0.3	5.7±0.4	4.7±0.3	13.7 miles @ 183°
54	Liberty St. & Co. Rt. 16 - Mexico H.S.	4.2±0.6	3.8±0.3	4.8±0.3	4.5±0.7	9.3 miles @ 115°
55	Gas Substation Co. Rt. 5-Pulaski	4.3±0.5	3.7±0.2	5.2±0.4	4.0±0.4	13.0 miles @ 75°
56*	Rt. 104-New Haven SCH.(SE Corner)	4.2±0.2	3.9±0.2	5.7±0.5	4.1±0.2	5.3 miles @ 123°
58*	Co. Rt. 1A-Alcan (E. of Entrance Rd.)	4.3±0.2	4.3±0.2	5.8±0.3	3.9±0.2	3.1 miles @ 220°
75*	Unit 2, N. Fence, N. of Reactor Bldg.	5.6±0.4	5.5±0.5	7.5±0.7	7.7±0.6	0.1 miles @ 5°
76*	Unit 2, N. Fence, N. of Change House	4.6±0.2	5.2±0.4	6.4±0.2	4.9±0.5	0.1 miles @ 25°
77*	Unit 2, N. Fence, N. of Pipe Bldg. JAF, E. of E. Old Lay Down Area	5.6±0.3	5.6±0.4	7.7±0.6	5.8±0.6	9.2 miles @ 45°
78*	Co. Rt. 29, Pole #63, 0.2 mi. S. of Lake Rd.	4.2±0.5	4.5±0.3	6.0±0.4	4.6±0.5	1.0 miles @ 90°
79*	Co. Rt. 29, Pole #54, 0.7 mi. S. of Lake Rd.	3.7±0.2	4.3±0.5	5.0±0.2	4.9±0.3	1.1 miles @ 115°
80*	Miner Rd., Pole #16, 0.5 mi. W of Rt. 29	4.0±0.3	3.8±0.4	5.5±0.7	4.0±0.5	1.4 miles @ 133°
81*	Miner Rd., Pole #1 1/2, 1.1 mi. W. of Rt. 29	3.6±0.2	4.1±0.3	5.7±0.3	4.4±0.3	1.6 miles @ 159°
82*	Lakview Rd., Tree 0.45 mi. N. of Miner Rd.	3.8±0.2	3.9±0.2	5.1±0.4	3.8±0.3	1.6 miles @ 181°
83*	Lakeview Rd., N., Pole #6117, 200 ft. N. of Lake Rd.	3.6±0.4	4.2±0.1	5.4±0.3	3.9±0.3	1.2 miles @ 200°
84*	Unit 1, N. Fence, N. of W. Side of Screen House	3.7±0.2	4.0±0.3	5.2±0.4	4.0±0.2	1.1 miles @ 225°
85*	Unit 2, N. Fence, N. of W. Side of Screen House	9.7±1.3	9.2±1.2	11.7±1.3	9.0±0.9	0.2 miles @ 294°
86*		6.5±0.8	6.5±1.1	7.5±1.6	6.4±1.0	0.1 miles @ 315°

TABLE 6-10 (CONTINUED)

DIRECT RADIATION MEASUREMENT RESULTS (1993)

Results in Units of mrem/std. Month ± 1 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
87*	Unit 2, N. Fence, N. of E. Side of Screen House	5.9±0.8	6.4±0.7	8.1±1.3	7.8±0.8	0.1 miles @ 341°
88*	Hickory Grove Rd., Pole #2. 0.6 mi. N. of Rt. 1	4.1±0.1	3.7±0.2	5.9±0.9	4.2±0.6	4.5 miles @ 97°
89*	Leavitt Rd., Pole #16, 0.4 mi. S. of Rt. 1	3.9±0.1	4.3±0.3	6.2±1.1	4.4±0.6	4.1 miles @ 111°
90*	Rt. 104, Pole #300, 150 Ft. E. of Keefe Rd.	3.5±0.2	3.9±0.3	5.0±0.4	5.1±0.5	4.2 miles @ 135°
91*	Rt. 51A, Pole #59, 0.8 mi. W. of Rt. 51	3.8±0.1	3.8±0.2	5.4±0.4	4.3±0.5	4.8 miles @ 156°
92*	Maiden Lane Rd., Power Pole, 0.6 mi. S. of Rt. 104	4.3±0.3	5.2±0.5	6.3±0.5	5.1±0.4	4.4 miles @ 183°
93*	Rt. 53, Pole 1-1, 120 ft. S. of Rt. 104	4.7±0.2	5.0±0.4	5.4±0.9	5.1±1.0	4.4 miles @ 205°
94*	Rt. 1, Pole #82, 250 ft. E. of Kocher Rd. (Co. Rt. #63)	3.4±0.1	3.7±0.3	4.2±0.3	4.0±0.3	4.7 miles @ 233°
95*	Lakeshore Camp Site, from Alcan W. access Rd. Pole #21, 1.2 mi. N. of Rt. 1	3.8±0.3	3.8±0.2	5.0±0.5	3.8±0.3	4.1 miles @ 237°
96*	Creamery Rd., 0.3 mi. S. of Middle Rd. Pole 1 1/2	4.5±0.3	4.3±0.1	5.0±0.3	5.1±0.8	3.6 miles @ 199°
97*	Rt. 29, Pole #50, 200 ft. N. of Miner Rd.	4.6±0.3	3.7±0.3	5.5±0.5	3.9±0.4	1.8 miles @ 143°
98*	Lake Rd., Pole #145, 0.15 mi. of of Rt. 29	4.3±0.2	4.2±0.3	5.6±0.8	4.4±0.4	1.2 miles @ 101°
99	NMP Rd., 0.4 mi. N. of Lake Rd., Env. Station R1 Off-site	3.5±0.4	3.6±0.2	5.0±0.2	4.5±0.3	1.8 miles @ 88°
100	Rt. 29 and Lake Rd., Env. Station R2 Off-site	4.4±0.4	3.9±0.3	4.5±0.3	4.2±0.2	1.1 miles @ 104°
101	Rt. 29, 0.7 mi. S. of Lake Rd., Env. Station R3	4.5±0.1	3.8±0.3	4.8±0.4	3.7±0.3	1.5 miles @ 132°

TABLE 6-10 (CONTINUED)

DIRECT RADIATION MEASUREMENT RESULTS (1993)

Results in Units of mrem/std. Month ± 1 Sigma

STATION NUMBER	LOCATION	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	LOCATION (DISTANCE AND DIRECTION)**
102	EOF/Env. Lab, Oswego Co. Airport (Fulton airport, Rt. 176)	4.1±0.2	4.3±0.5	4.5±0.2	4.4±0.3	11.9 miles @ 175°
103	EIC, East Garage Rd., Lamp Post R3 Off-site	4.3±0.2	4.3±0.4	6.0±0.3	4.1±0.3	0.4 miles @ 267°
104	Parkhurst Road, Pole #148 1/2-A, 0.1 miles South of Lake Rd.	4.5±0.2	3.8±0.3	5.0±0.2	4.4±0.3	1.4 miles @ 102°
105	Lakeview Rd., Pole #6125, 0.6 mi. South of Lake Road	4.1±0.2	4.5±0.1	5.7±0.6	3.7±0.2	1.4 miles @ 198°
106	Shoreline Cove, East of NMP-1, Tree on West Edge	4.7±0.4	4.6±0.5	6.0±0.3	4.7±0.5	0.3 miles @ 274°
107	Shoreline Cove, East of NMP-1	5.1±0.3	4.6±0.3	5.4±0.5	4.6±0.3	0.3 miles @ 272°
108	Pole #143, South of Lake Road, 300 ft. East of Rt. 29	4.8±0.3	4.1±0.3	5.4±0.4	4.1±0.3	1.1 miles @ 104°
109	Tree North of Lake Road, 300 ft. East of Route 29	4.0±0.3	4.0±0.2	5.5±0.3	3.9±0.3	1.1 miles @ 103°
111	Control, Sterling, NY	4.6±0.2	4.0±0.3	5.3±0.2	4.2±0.4	21.8 miles @ 214°
113	Control, Baldwinsville, NY	3.8±0.3	3.9±0.3	4.6±0.2	3.6±0.3	24.7 miles @ 178°

* Technical Specification Location

** Direction and distance based on NMP-2 reactor centerline and sixteen 22.5 degree sectors

*** TLD lost in field

† Results from Panasonic TLD System. See Section 3.5.

TABLE 6-11

CONCENTRATIONS OF IODINE-131 IN MILK

Results in Units of pCi/liter ± 1 Sigma

STATION*	04/05/93	04/19/93	05/03/93	05/17/93	06/07/93	06/21/93
No. 60	<0.499	<0.371	<0.405	<0.451	<0.363	<0.657
No. 55	<0.421	<0.567	<0.595	<0.405	<0.544	<0.377
No. 50	<0.335	<0.337	<0.371	<0.381	<0.494	<0.450
No. 7	<0.463	<0.440	<0.502	<0.597	<0.449	<0.349
No. 4	<0.602	<0.438	<0.778	<0.373	<0.735	<0.471
No. 65 (Control)	<0.383	<0.370	<0.652	<0.347	<0.397	<0.612

* Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-11 (CONTINUED)

CONCENTRATIONS OF IODINE-131 IN MILK

Results in Units of pCi/liter ± 1 Sigma

STATION*	07/06/93	07/19/93	08/02/93	08/16/93	09/07/93	09/20/93
No. 60	<0.330	<0.608	<0.440	<0.369	<0.333	<0.427
No. 55	<0.365	<0.657	<0.364	<0.494	<0.428	<0.508
No. 50	<0.389	<0.439	<0.464	<0.516	<0.412	<0.535
No. 7	<0.442	<0.352	<0.360	<0.428	<0.378	<0.452
No. 4	<0.413	<0.387	<0.490	<0.723	<0.658	<0.519
No. 65/73 (Control)	<0.595	<0.515	<0.638	<0.677**	<0.614**	<0.465**

* Corresponds to sample locations noted on the maps in Section 3.3.

** New control location number 73

TABLE 6-11 (CONTINUED)

CONCENTRATIONS OF IODINE-131 IN MILK

Results in Units of pCi/liter ± 1 Sigma

STATION*	10/04/93	10/18/93	11/01/93	11/15/93	12/06/93	12/20/93
No. 60	<0.487	<0.412	<0.451	<0.417	<0.577	<0.369
No. 55	<0.403	<0.364	<0.400	<0.507	<0.386	<0.390
No. 50	<0.437	<0.337	<0.450	<0.458	<0.447	<0.340
No. 7	<0.377	<0.437	<0.397	<0.367	<0.367	<0.390
No. 4	<0.370	<0.400	<0.568	<0.375	<0.373	<0.440
No. 73 (Control)	<0.338	<0.551	<0.344	<0.586	<0.337	<0.339

* Corresponds to sample locations noted on the maps in Section 3.3.

TABLE 6-12

CONCENTRATIONS OF GAMMA EMITTERS IN MILK

Results in Units of pCi/liter ± 1 Sigma

STATION*	NUCLIDES	04/05/93	04/19/93	05/04/93	05/17/93	06/07/93	06/21/93
No. 60	K-40	1640±49	1590±69	2680±73	2720±73	1540±75	1770±72
	Cs-134	<6.50	<6.21	<10.6	<10.6	<7.61	<6.00
	Cs-137	<6.26	<6.49	<8.24	<8.00	<6.75	<5.84
	Ba/La-40	<6.56	<8.58	<7.58	<7.10	<12.1	<9.01
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	2620±72	1440±68	1450±73	1520±67	1490±75	1620±78
	Cs-134	<9.90	<5.78	<6.95	<6.32	<7.27	<7.96
	Cs-137	<8.12	<6.32	<7.23	<6.82	<5.86	<6.55
	Ba/La-40	<8.73	<8.71	<11.5	<4.57	<9.86	<7.35
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1710±71	2560±72	1550±75	1600±69	2730±75	2680±72
	Cs-134	<5.18	<9.44	<6.67	<6.25	<10.1	<10.3
	Cs-137	<6.76	<8.09	<7.23	<6.32	<8.34	<8.69
	Ba/La-40	<7.77	<7.33	<8.72	<8.49	<7.81	<6.59
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1480±76	1270±71	1540±67	1340±71	1490±68	1410±63
	Cs-134	<7.10	<7.10	<6.13	<6.72	<5.62	<5.83
	Cs-137	<6.94	<7.01	<6.54	<6.78	<6.82	<6.95
	Ba/La-40	<8.89	<7.73	<6.86	<8.89	<7.07	<8.75
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1570±67	2610±72	1490±66	1650±69	1530±67	1790±72
	Cs-134	<5.65	<10.1	<5.61	<6.17	<5.70	<6.59
	Cs-137	<6.18	<8.37	<6.82	<6.37	<6.32	<6.37
	Ba/La-40	<7.43	<7.38	<10.3	<6.85	<10.1	<8.19
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1190±58	1700±71	1590±71	2450±70	1790±73	1370±65
	Cs-134	<5.65	<6.58	<6.47	<10.1	<5.87	<6.52
	Cs-137	<5.87	<6.54	<6.32	<8.03	<6.20	<6.10
	Ba/La-40	<10.1	<6.54	<8.62	<7.34	<6.69	<9.12
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Corresponds to sample locations noted on the maps in Section 3.3.

† Plant related radionuclides.

TABLE 6-12 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MILK

Results in Units of pCi/liter ± 1 Sigma

STATION*	NUCLIDES	07/06/93	07/19/93	08/02/93	08/16/93	09/07/93	09/20/93
No. 60	K-40	1320±62	1450±74	2650±73	1720±71	1420±64	1580±83
	Cs-134	<7.41	<7.71	<10.4	<8.37	<5.57	<7.60
	Cs-137	<6.95	<5.07	<8.00	<6.02	<5.87	<7.21
	Ba/La-40	<9.65	<9.51	<9.09	<9.88	<6.15	<11.6
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1600±68	2530±71	1470±74	1410±78	2690±73	1400±64
	Cs-134	<6.00	<10.3	<7.47	<8.43	<10.1	<5.65
	Cs-137	<6.47	<7.51	<7.31	<8.08	<8.06	<6.40
	Ba/La-40	<9.62	<6.29	<9.33	<13.3	<9.23	<11.0
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1350±71	1400±65	1360±64	1440±65	1630±69	1430±75
	Cs-134	<7.21	<6.48	<5.33	<5.56	<6.21	<6.06
	Cs-137	<6.38	<6.92	<6.40	<5.79	<6.26	<6.86
	Ba/La-40	<10.9	<6.94	<7.75	<10.1	<7.41	<7.70
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1490±67	1630±70	2700±73	1540±68	1420±63	1480±66
	Cs-134	<5.65	<7.05	<9.90	<6.25	<5.28	<5.60
	Cs-137	<6.54	<6.54	<7.77	<6.49	<6.54	<7.15
	Ba/La-40	<9.45	<6.98	<7.78	<8.89	<7.88	<14.7
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	2720±73	1440±64	1530±67	1390±63	1640±70	1670±71
	Cs-134	<10.0	<6.74	<6.42	<6.40	<6.38	<6.09
	Cs-137	<8.06	<7.46	<6.14	<5.94	<6.37	<5.25
	Ba/La-40	<8.37	<10.9	<6.86	<5.85	<8.60	<9.29
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 65 (Control)	K-40	1750±71	2380±68	1570±71			
	Cs-134	<6.17	<9.73	<7.12			
	Cs-137	<6.37	<8.27	<7.38	**	**	**
	Ba/La-40	<6.54	<7.66	<12.0			
	Others†	<LLD	<LLD	<LLD			
No. 73 (Control)	K-40				1490±66	1560±83	1720±71
	C. -134				<6.85	<8.42	<5.86
	Cs-137	***	***	***	<6.75	<6.25	<6.49
	Ba/La-40				<8.25	<9.86	<8.16
	Others†				<LLD	<LLD	<LLD

* Corresponds to sample locations noted on the maps in Section 3.3.

† Plant related radionuclides

** Sample location has been discontinued

*** New sample location starting August 16, 1993

TABLE 6-12 (CONTINUED)

CONCENTRATIONS OF GAMMA EMITTERS IN MILK

Results in Units of pCi/liter ± 1 Sigma

STATION*	NUCLIDES	10/04/93	10/18/93	11/01/93	11/16/93	12/06/93	12/20/93
No. 60	K-40	1510±66	2380±65	1570±43	1610±70	1570±75	1390±72
	Cs-134	<5.43	<6.77	<6.78	<6.58	<6.49	<6.60
	Cs-137	<6.40	<6.40	<6.20	<5.84	<6.94	<7.16
	Ba/La-40	<9.23	<6.82	<9.23	<7.00	<8.35	<8.90
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 55	K-40	1480±75	1460±51	1460±74	1520±66	2280±64	1560±77
	Cs-134	<6.78	<5.24	<6.88	<5.61	<7.38	<7.00
	Cs-137	<5.58	<5.87	<5.48	<5.79	<6.50	<6.22
	Ba/La-40	<12.3	<7.81	<9.90	<8.29	<7.00	<9.36
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 50	K-40	1480±82	1420±65	1690±71	1490±66	1550±76	1290±75
	Cs-134	<8.48	<5.87	<6.58	<6.59	<7.36	<7.99
	Cs-137	<7.21	<7.08	<5.71	<6.10	<6.47	<8.64
	Ba/La-40	<9.35	<8.65	<4.85	<6.37	<11.3	<7.35
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 7	K-40	1470±65	1630±69	1390±65	1600±69	2100±62	1790±72
	Cs-134	<5.56	<6.12	<5.51	<5.72	<7.13	<6.38
	Cs-137	<6.32	<5.31	<6.18	<6.20	<6.15	<6.32
	Ba/La-40	<8.70	<8.51	<10.1	<8.15	<6.94	<8.97
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 4	K-40	1640±70	1520±75	2300±64	1550±81	1590±86	2400±67
	Cs-134	<6.55	<7.67	<6.53	<7.32	<7.17	<6.90
	Cs-137	<6.76	<6.04	<6.07	<7.96	<7.96	<6.07
	Ba/La-40	<9.64	<9.91	<6.30	<7.35	<10.4	<6.95
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
No. 73 (Control)	K-40	1470±79	1350±71	1380±64	2190±63	1730±86	2230±64
	Cs-134	<7.53	<6.72	<6.00	<7.29	<7.66	<7.54
	Cs-137	<7.41	<6.38	<7.40	<6.05	<7.78	<6.45
	Ba/La-40	<8.49	<8.31	<10.1	<6.02	<10.4	<7.20
	Others†	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Corresponds to sample locations noted on the maps in Section 3.3.

† Plant related radionuclides

** Sample location has been sold

TABLE 6-13

MILK ANIMAL CENSUS 1994

TOWN OR AREA[a]	NUMBER ON CENSUS MAP[1]	DEGREES[2]	DISTANCE[2]	NUMBER OF MILK ANIMALS
Scriba	16*	190°	5.9 miles	NONE
	3	190°	4.5	3C
	6	162°	2.2	1C
	26	114°	1.5	NONE
	61	140°	3.0	NONE
	62	183°	6.7	2G
	63	185°	8.0	35C
New Haven	9	95°	5.2	40C
	4*	113°	7.8	100C
	45	125°	8.0	ND
	10	130°	2.6	30C
	5	146°	7.2	51C
	11	130°	8.5	NONE
	7*	107°	5.5	63C
	64	107°	7.9	53C
	71	111°	4.2	NONE
Mexico	72†	98°	9.9	33C
	12	107°	11.5	21C
	14	120°	9.8	56C
	17	115°	10.2	2C
	19	132°	10.5	40C
	60*	90°	9.5	40C
	50*	93°	8.2	140C
	55*	95°	9.2	50C
	21	112°	10.5	75C
	68	108°	11.6	NONE
	49	88°	7.9	8G
Richland	22	85°	10.2	46C
Pulaski	23	92°	10.5	NONE
	69	85°	11.6	60C

TABLE 6-13 (CONTINUED)

MILK ANIMAL CENSUS 1993

TOWN OR AREA(a)	NUMBER ON CENSUS MAP(1)	DEGREES(2)	DISTANCE(2)	NUMBER OF MILK ANIMALS
Sterling	65** 73†	220° 234°	17.0 miles 13.8 miles	25C 46C (b)
Volney	25 70 66	182° 147° 156°	9.5 9.4 7.8	NONE 27C 70C

	8/2/93	8/16/93††
MILKING ANIMAL TOTALS: (including control locations)	1,107 Cows 10 Goats	1,082 Cows(b) 10 Goats
MILKING ANIMAL TOTALS: (excluding control locations)	1,082 Cows 10 Goats	1,036 Cows(b) 10 Goats

†† New control location 8/16/93

C = Cows

G = Goats

* = Milk sample location

** = Milk sample control location

† = New location

ND = Did not wish to participate in the survey

(1) = References Section 3.3

(2) = Based on Nine Mile Point Unit 2 Reactor Centerline

NONE = No cows or goats at that location. Location was a previous location with cows and/or goats.

(a) = Census performed out to a distance of approximately ten miles.

(b) = As of August 2, 1993 Scott Crawford has gone out of the milking business and a new control location was added to the REMP.

TABLE 6-14

CONCENTRATIONS OF GAMMA EMITTERS IN VARIOUS FOOD PRODUCTS

Results in Units of pCi/g (wet) ± 1 Sigma

COLLECTION SITE	SAMPLE DATE	DESCRIPTION	Be-7	K-40	I-131	Cs-134	Cs-137	Zn-65
T*	09/13/93	Cabbage Leaves	0.16±0.03	2.99±0.11	<0.013	<0.012	<0.011	<0.031
	09/13/93	Squash Leaves	0.96±0.39	2.90±0.09	<0.009	<0.009	<0.008	<0.025
	09/13/93	Bean Leaves	1.33±0.04	6.95±0.12	<0.015	<0.016	<0.012	<0.038
K*	09/13/93	Squash Leaves	0.63±0.03	2.11±0.06	<0.012	<0.007	<0.006	<0.020
	09/13/93	Tomato	<0.051	2.28±0.05	<0.019	<0.006	<0.007	<0.021
L	09/13/93	Bean Leaves	0.84±0.03	2.00±0.06	<0.008	<0.006	<0.006	<0.017
	09/13/93	Squash Leaves	0.85±0.02	2.08±0.05	<0.017	<0.006	<0.006	<0.018
	09/13/93	Pepper Leaves	0.42±0.03	4.70±0.09	<0.022	<0.007	<0.007	<0.022
P	09/13/93	Collards	0.42±0.04	4.04±0.13	<0.030	<0.012	<0.012	<0.039
	09/13/93	Cabbage	0.19±0.04	1.92±0.09	<0.019	<0.013	<0.009	<0.033
	09/13/93	Swisschard	0.31±0.04	4.02±0.12	<0.023	<0.012	<0.009	<0.032
Z	09/13/93	Lettuce Leaves	0.61±0.07	4.80±0.20	<0.026	<0.003	<0.025	<0.068
	09/13/93	Grape Leaves	1.32±0.05	2.96±0.09	<0.015	<0.010	<0.009	<0.032
	09/13/93	Squash Leaves	0.85±0.03	3.50±0.08	<0.008	<0.007	<0.007	<0.022
M* (Control)	09/13/93	Beet Leaves	0.20±0.03	5.94±0.13	<0.018	<0.011	<0.010	<0.035
	09/13/93	Cabbage	0.09±0.04	2.23±0.11	<0.016	<0.013	<0.011	<0.040
	09/13/93	Squash Leaves	1.70±0.04	3.35±0.09	<0.013	<0.008	<0.008	<0.025
	09/13/93	Cucumber Leaves	2.48±0.03	3.12±0.06	<0.014	<0.010	0.008±.002	<0.029
	09/13/93	Grape Leaves	1.21±0.05	2.01±0.10	<0.013	<0.013	<0.011	<0.029
	09/14/93	Tomato	<0.042	2.00±0.06	<0.011	<0.005	<0.005	<0.017

NOTE: Other Plant Related Radionuclides <LLD

* Samples required by Technical Specifications

TABLE 6-15

1993 RESIDENCE CENSUS

LOCATION	MAP DESIGNATION[b]	METEROLOGICAL SECTOR	DEGREES[a]	DISTANCE[a]
w		N	-	-
w		NNE	-	-
w		NE	-	-
w		ENE	-	-
Sunset Bay	A	E	82°	0.9 miles
Lake Road	B	ESE	119°	0.7 miles
Parkhurst Road	C	SE	127°	1.2 miles
County Route 29	D	SSE	149°	1.2 miles
Miner Road	E	S	173°	1.6 miles
Lakeview Road	F	SSW	210°	1.7 miles
Lakeview Road	G	SW	233°	1.5 miles
Bible Camp Retreat	H	WSW	249°	1.3 miles
w		W	-	-
w		WNW	-	-
w		NW	-	-
w		NNW	-	-

w This meteorological sector is over Lake Ontario. There are no residences within three miles.

[a] Based on J. A. FitzPatrick Nuclear Power Plant Reactor Centerline.

[b] See the maps in Section 3.3.

7.0 HISTORICAL DATA TABLES

Sample Statistics from Previous Environmental Sampling

The mean, minimum value and maximum value were calculated for selected sample mediums and isotopes.

Special Considerations:

1. Sample data listed as 1969 was taken from the NINE MILE POINT, PREOPERATION SURVEY, 1969 and ENVIRONMENTAL MONITORING REPORT FOR NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT NUCLEAR STATION, NOVEMBER, 1970.

2. Sample data listed as 1974 and 1978 through 1992 was taken from the respective environmental operating reports for Nine Mile Point Nuclear Station and James A. FitzPatrick Nuclear Power Plant.

3. Only measured values were used for statistical calculations.

4. The term MDL was used prior to 1979 to represent the concept of Lower Limit of Detection (LLD). MDL = Minimum Detectable Level.

TABLE 7-1

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SHORELINE SEDIMENT

Results in pCi/g (dry)

LOCATION: CONTROL *									
Isotope	Cs-134			Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
1969	**	**	**	**	**	**	**	**	**
1974	**	**	**	**	**	**	**	**	**
1975	**	**	**	**	**	**	**	**	**
1976	**	**	**	**	**	**	**	**	**
1977	**	**	**	**	**	**	**	**	**
1978	**	**	**	**	**	**	**	**	**
1979	**	**	**	**	**	**	**	**	**
1980	**	**	**	**	**	**	**	**	**
1981	**	**	**	**	**	**	**	**	**
1982	**	**	**	**	**	**	**	**	**
1983	**	**	**	**	**	**	**	**	**
1984	**	**	**	**	**	**	**	**	**
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	0.027	0.027	0.027	<LLD	<LLD	<LLD

* Langs Beach - beyond influence of the site in a westerly direction.

** No data. Sample not required until new technical specifications implemented in 1985.

TABLE 7-2

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SHORELINE SEDIMENT

Results in pCi/g (dry)

LOCATION: INDICATOR *									
Isotope	Cs-134			Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
1969	**	**	**	**	**	**	**	**	**
1974	**	**	**	**	**	**	**	**	**
1975	**	**	**	**	**	**	**	**	**
1976	**	**	**	**	**	**	**	**	**
1977	**	**	**	**	**	**	**	**	**
1978	**	**	**	**	**	**	**	**	**
1979	**	**	**	**	**	**	**	**	**
1980	**	**	**	**	**	**	**	**	**
1981	**	**	**	**	**	**	**	**	**
1982	**	**	**	**	**	**	**	**	**
1983	**	**	**	**	**	**	**	**	**
1984	**	**	**	**	**	**	**	**	**
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	0.25	0.32	0.29	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	0.28	0.30	0.29	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	0.12	0.14	0.13	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	0.12	0.14	0.13	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	0.18	0.46	0.32	<LLD	<LLD	<LLD

* Sunset Beach - closest off-site location with recreational value.

** No data. Sample not required until new technical specifications implemented in 1985.

TABLE 7-3

HISTORICAL ENVIRONMENTAL SAMPLE DATA

FISH

Results in pCi/g (wet)

LOCATION: CONTROL *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	No Data	No Data	No Data
1974†	0.94	0.94	0.94
1975	<MDL	<MDL	<MDL
1976	1.2	1.2	1.2
1977	0.13	0.13	0.13
1978	0.04	0.20	0.09
1979	0.03	0.06	0.04
1980	0.029	0.110	0.059
1981	0.028	0.062	0.043
1982	0.027	0.055	0.047
1983	0.040	0.060	0.050
1984	0.015	0.038	0.032
1985	0.026	0.047	0.034
1986	0.021	0.032	0.025
1987	0.017	0.040	0.031
1988	0.023	0.053	0.034
1989	0.028	0.043	0.034
1990	0.033	0.079	0.045
1991	0.021	0.034	0.029
1992	0.019	0.026	0.022
1993	0.030	0.036	0.033

* Control location was at an area beyond the influence of the site (westerly direction).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-4

HISTORICAL ENVIRONMENTAL SAMPLE DATA

FISH

Results in pCi/g (wet)

LOCATION: INDICATOR * (NMP/JAF)			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	0.01	0.13	0.06
1974†	0.08	4.40	0.57
1975	1.10	1.70	1.38
1976	0.50	3.90	1.4
1977	0.13	0.79	0.29
1978	0.03	0.10	0.08
1979	0.02	0.55	0.10
1980	0.030	0.100	0.061
1981	0.027	0.10	0.061
1982	0.034	0.064	0.050
1983	0.030	0.060	0.050
1984	0.033	0.061	0.043
1985	0.018	0.045	0.030
1986	0.009	0.051	0.028
1987	0.024	0.063	0.033
1988	0.022	0.054	0.032
1989	0.020	0.044	0.034
1990	0.027	0.093	0.040
1991	0.018	0.045	0.029
1992	0.014	0.030	0.024
1993	0.018	0.035	0.028

* Indicator locations are in the general area of the NMP-1 and J. A. FitzPatrick cooling water discharge structures.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-5

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER

Results in pCi/liter

LOCATION: CONTROL †						
Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969††	*	*	*	*	*	*
1974††	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	**	**	**	**	**	**
1978	<MDL	<MDL	<MDL	**	**	**
1979	2.5	2.5	2.5	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD	1.4	1.4	1.4
1982	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No gamma analysis performed (not required).

** Data showed instrument background results.

† Location was the City of Oswego Water Supply for 1969 - 1984 and the Oswego Steam Station inlet canal for 1985 - 1993.

†† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-6

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER

Results in pCi/liter

LOCATION: INDICATOR †						
Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969††	*	*	*	*	*	*
1974††	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	**	**	**	**	**	**
1978	<MDL	<MDL	<MDL	**	**	**
1979	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1982	0.43	0.43	0.43	1.6	2.4	1.9
1983	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No gamma analysis performed (not required).

** Data showed instrument background results.

† Indicator location was the NMP 1 Inlet Canal for the period 1969 - 1973, and the JAF Inlet Canal for 1974 - 1993.

†† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-7

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER TRITIUM

Results in pCi/liter

LOCATION: CONTROL *			
Isotope	Tritium		
Year	Min.	Max.	Mean
1969†	No Data	No Data	No Data
1974†	<MDL	<MDL	<MDL
1975	311	414	362
1976	440	929	652
1977	300	530	408
1978	215	490	304
1979	174	308	259
1980	211	290	257
1981	211	357	293
1982	112	307	165
1983	230	280	250
1984	190	220	205
1985	230	430	288
1986	250	550	373
1987	140	270	210
1988	240	460	320
1989	143	217	186
1990	260	320	290
1991	180	200	190
1992	190	310	243
1993	160	230	188

* Control location is the City of Oswego, drinking water for 1969 - 1984 and the Oswego Steam Station inlet canal for 1985 - 1993.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-8

HISTORICAL ENVIRONMENTAL SAMPLE DATA

SURFACE WATER TRITIUM

Results in pCi/liter

LOCATION: INDICATOR *			
Isotope	Tritium		
Year	Min.	Max.	Mean
1969†	No Data	No Data	No Data
1974†	380	500	440
1975	124	482	335
1976	297	889	513
1977	380	530	450
1978	253	560	389
1979	176	286	234
1980	150	457	263
1981	183	388	258
1982	194	2780	641
1983	190	560	317
1984	110	370	282
1985	250	1200**	530
1986	260	500	380
1987	160	410	322
1988	430	480	460
1989	135	288	225
1990	220	290	250
1991	250	390	310
1992	240	300	273
1993	200	280	242

* Indicator location was the NMP-1 Inlet Canal during the period 1969-1973, and the JAF Inlet Canal for 1974-1993.

** Suspect sample contamination. Recollected samples showed normal levels of tritium.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-9

HISTORICAL ENVIRONMENTAL SAMPLE DATA

AIR PARTICULATE GROSS BETA

Results in pCi/m^3

LOCATION: CONTROL *			
Isotope	Gross Beta		
Year	Min.	Max.	Mean
1969†	0.130	0.540	0.334
1974†	0.001	0.808	0.121
1975	0.008	0.294	0.085
1976	0.004	0.240	0.051
1977	0.001	0.484	0.126
1978	0.010	0.650	0.144
1979	0.010	0.703	0.077
1980	0.009	0.291	0.056
1981	0.016	0.549	0.165
1982	0.011	0.078	0.033
1983	0.007	0.085	0.024
1984	0.013	0.051	0.026
1985	0.013	0.043	0.024
1986	0.008	0.272	0.039
1987	0.009	0.037	0.021
1988	0.008	0.039	0.018
1989	0.007	0.039	0.017
1990	0.003	0.027	0.013
1991	0.007	0.028	0.014
1992	0.006	0.020	0.012
1993	0.007	0.022	0.013

* Locations used for 1977 - 1984 were C off-site, D1 off-site, D2 off-site, E off-site, F off-site, and G off-site. Control location R-5 off-site was used for 1985 - 1993 (formerly C off-site location).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-10

HISTORICAL ENVIRONMENTAL SAMPLE DATA

AIR PARTICULATE GROSS BETA

Results in pCi/m^3

LOCATION: INDICATOR *			
Isotope	Gross Beta		
Year	Min.	Max.	Mean
1969†	0.130	0.520	0.320
1974†	0.003	0.885	0.058
1975	0.001	0.456	0.067
1976	0.002	0.191	0.047
1977	0.016	0.140	0.070
1978	0.006	0.340	0.102
1979	0.001	0.271	0.058
1980	0.002	0.207	0.045
1981	0.004	0.528	0.151
1982	0.001	0.113	0.031
1983	0.003	0.062	0.023
1984	0.001	0.058	0.025
1985	0.001	0.044	0.021
1986	0.007	0.289	0.039
1987	0.009	0.040	0.021
1988	0.007	0.040	0.018
1989	0.007	0.041	0.017
1990	0.006	0.023	0.014
1991	0.006	0.033	0.015
1992	0.005	0.024	0.013
1993	0.005	0.023	0.014

* Locations used for 1969 - 1973 were D1 on-site, D2 on-site, E on-site, F on-site and G on-site. Locations used for 1974 - 1984 were D1 on-site, D2 on-site, E on-site, F on-site, G on-site, H on-site, I on-site, J on-site and K on-site, as applicable. 1985 - 1993 locations were R-1 off-site, R-2 off-site, R-3 off-site, and R-4 off-site.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-11

HISTORICAL ENVIRONMENTAL SAMPLE DATA

AIR PARTICULATES

Results in pCi/m^3

LOCATION: CONTROL **						
Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	*	*	*	*	*	*
1974†	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	0.0002	0.0112	0.0034	0.0034	0.0347	0.0172
1978	0.0008	0.0042	0.0018	0.0003	0.0056	0.0020
1979	0.0008	0.0047	0.0016	0.0005	0.0014	0.0009
1980	0.0015	0.0018	0.0016	<LLD	<LLD	<LLD
1981	0.0003	0.0042	0.0017	0.0003	0.0012	0.0008
1982	0.0002	0.0009	0.0004	0.0004	0.0007	0.0006
1983	0.0002	0.0002	0.0002	0.0007	0.0007	0.0007
1984	<LLD	<LLD	<LLD	0.0004	0.0012	0.0008
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	0.0075	0.0311	0.0193	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No data available (not required prior to 1977).

** Locations included composites of off-site air monitoring locations for 1977 - 1984. Sample location included only R-5 air monitoring location for 1985 - 1993.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-12

HISTORICAL ENVIRONMENTAL SAMPLE DATA

AIR PARTICULATES

Results in pCi/m^3

LOCATION: INDICATOR **						
Isotope	Cs-137			Co-60		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	*	*	*	*	*	*
1974†	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	0.0001	0.0105	0.0043	0.0003	0.0711	0.0179
1978	0.0003	0.0026	0.0016	0.0003	0.0153	0.0023
1979	0.0003	0.0020	0.0010	0.0003	0.0007	0.0005
1980	0.0005	0.0019	0.0011	0.0016	0.0016	0.0016
1981	0.0002	0.0045	0.0014	0.0002	0.0017	0.0006
1982	0.0001	0.0006	0.0004	0.0003	0.0010	0.0005
1983	0.0002	0.0003	0.0002	0.0003	0.0017	0.0007
1984	<LLD	<LLD	<LLD	0.0007	0.0017	0.0012
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	0.0069	0.0364	0.0183	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No data available (not required prior to 1977).

** Locations included composites of on-site air monitoring locations for 1977 - 1984. Sample locations included R-1 through R-4 air monitoring locations for 1985 - 1993.

† 1969 data is consied to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-13

HISTORICAL ENVIRONMENTAL SAMPLE DATA

AIR RADIOIODINE

Results in pCi/m^3

LOCATION: CONTROL *			
Isotope	Iodine-131		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975	<MDL	<MDL	<MDL
1976	0.01	5.88	0.60
1977	0.02	0.82	0.32
1978	0.03	0.04	0.03
1979	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD
1982	0.039	0.039	0.039
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD
1986	0.041	0.332	0.151
1987	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD

* Locations D1 off-site, D2 off-site, E off-site, F off-site and G off-site used for 1976 - 1984. Location R-5 off-site used for 1985 - 1993.

** No results - I-131 analysis not required.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-14

HISTORICAL ENVIRONMENTAL SAMPLE DATA
AIR RADIOIODINE
Results in pCi/m^3

LOCATION: INDICATOR *			
Isotope	Iodine-131		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975	0.25	0.30	0.28
1976	0.01	2.09	0.33
1977	0.02	0.73	0.31
1978	0.02	0.07	0.04
1979	<LLD	<LLD	<LLD
1980	0.013	0.013	0.013
1981	0.016	0.042	0.029
1982	0.002	0.042	0.016
1983	0.022	0.035	0.028
1984	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD
1986	0.023	0.360	0.119
1987	0.011	0.018	0.014
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD

* Locations used for 1976 - 1984 were D1 on-site, D2 on-site, E on-site, F on-site, G on-site, H on-site, I on-site, J on-site and K on-site, as applicable. Locations used for 1985 - 1993 were R-1 off-site, R-2 off-site, R-3 off-site, and R-4 off-site.

** No results - I-131 analysis not required.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-15A

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem/standard month

LOCATION: CONTROL **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1970	6.0	7.3	6.7
1971	2.0	6.7	4.3
1972	2.2	6.2	4.4
1973	2.2	6.9	4.7
1974†	2.7	8.9	5.6
1975	4.8	6.0	5.5
1976	3.2	7.2	5.4
1977	4.0	8.0	5.3
1978	3.3	4.7	4.3
1979	3.3	5.7	4.7
1980	3.8	5.8	4.9
1981	3.5	5.9	4.8
1982	3.8	6.1	5.1
1983	4.9	7.2	5.8
1984	4.7	8.2	6.2
1985	4.5	7.6	5.6
1986	5.3	7.5	6.3
1987	4.6	6.6	5.4
1988	4.4	6.8	5.6
1989	2.9	6.4	4.7
1990	3.7	6.0	4.7
1991	3.8	5.8	4.7
1992	2.6	5.1	4.1
1993	3.4	5.7	4.4

* Data not available.

** TLD #8, 14, 49, 111 established 1985, TLD #113 established 1992.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-15B

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: RETS CONTROL **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1970	6.0	7.3	6.7
1971	2.0	6.7	4.3
1972	2.2	6.2	4.4
1973	2.2	6.9	4.7
1974†	2.7	8.9	5.6
1975	4.8	6.0	5.5
1976	3.2	7.2	5.4
1977	4.0	8.0	5.3
1978	3.3	4.7	4.3
1979	3.3	5.7	4.7
1980	3.8	5.8	4.9
1981	3.5	5.9	4.8
1982	3.8	6.1	5.1
1983	4.9	7.2	5.8
1984	4.7	8.2	6.2
1985	4.4	6.8	5.4
1986	5.5	7.2	6.3
1987	4.6	5.8	5.2
1988	4.8	6.8	5.4
1989	2.9	6.4	4.1
1990	3.7	6.0	4.8
1991	3.8	5.3	4.6
1992	2.6	4.7	3.9
1993	3.4	5.3	4.4

* Data not available.

** TLD #14 and 49 (RETS Control Locations).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16A

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: SITE BOUNDARY **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1970	*	*	*
1971	*	*	*
1972	*	*	*
1973	*	*	*
1974†	*	*	*
1975	*	*	*
1976	*	*	*
1977	*	*	*
1978	*	*	*
1979	*	*	*
1980	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	4.9(4.1)	5.9(12.6)	5.3(6.2)
1986	5.4(4.4)	6.8(18.7)	5.9(7.0)
1987	4.7(4.4)	5.9(14.3)	5.3(6.1)
1988	5.0(3.4)	6.1(17.9)	5.4(6.4)
1989	4.5(2.8)	5.2(15.4)	4.8(5.9)
1990	4.5(3.6)	5.4(14.9)	4.8(6.4)
1991	4.3(3.2)	5.5(16.7)	4.8(6.0)
1992	3.7(3.2)	4.6(10.4)	4.2(5.1)
1993	3.8(3.3)	4.8(11.7)	4.3(5.4)

* Data not available (not required prior to 1985).

** TLD locations initiated in 1985 as required by the New Technical Specifications. Includes TLD numbers 7, 18, 78 - 84 (1985-1993).

() Several of the site boundary TLDs numbers 23,75,76,77,85,86 and 87 are in close proximity to site operational buildings not generally accessible to the public, the measured doses and are not representative of the site boundary dose. The statistics for all the Site Boundary TLDs are noted in the parenthesis.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16B

HISTORICAL ENVIRONMENTAL SAMPLE DATA
ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: OFF-SITE SECTORS **			
Year	Min.	Max.	Mean
Preopt	*	*	*
1970	*	*	*
1971	*	*	*
1972	*	*	*
1973	*	*	*
1974†	*	*	*
1975	*	*	*
1976	*	*	*
1977	*	*	*
1978	*	*	*
1979	*	*	*
1980	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	4.0	7.1	5.0
1986	4.6	8.6	6.0
1987	4.3	6.0	5.2
1988	3.8	7.0	5.3
1989	2.5	6.8	4.9
1990	3.6	6.3	4.7
1991	3.6	5.8	4.7
1992	2.9	5.0	4.1
1993	3.4	6.3	4.5

* Data not available (not required prior to 1985).

** TLD locations initiated in 1985 as required by the New Technical Specifications. Includes TLD numbers 88, 89, 90, 91, 92, 93, 94 and 95.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16C

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: SPECIAL INTEREST **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1970	*	*	*
1971	*	*	*
1972	*	*	*
1973	*	*	*
1974†	*	*	*
1975	*	*	*
1976	*	*	*
1977	*	*	*
1978	*	*	*
1979	*	*	*
1980	*	*	*
1981	*	*	*
1982	*	*	*
1983	*	*	*
1984	*	*	*
1985	3.9	6.8	5.3
1986	4.8	8.2	6.1
1987	3.5	6.0	5.1
1988	3.9	6.6	5.3
1989	2.1	6.4	4.9
1990	3.2	6.3	4.8
1991	2.9	5.6	4.4
1992	3.0	4.8	4.1
1993	3.2	5.8	4.5

* Data not available (not required prior to 1985).

** TLD locations initiated in 1985 as required by the New Technical Specifications. Includes TLD numbers 15, 56, 58, 96, 97 and 98, which are located near critical residences and populated areas near the site.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16D

HISTORICAL ENVIRONMENTAL SAMPLE DATA
ENVIRONMENTAL TLD
Results in mrem per standard month

LOCATION: ON-SITE INDICATOR **			
Year	Min.	Max.	Mean
Preop†	*	*	*
1970	4.7	9.0	6.0
1971	1.5	7.7	4.7
1972	2.3	8.2	4.9
1973	3.0	24.4	6.6
1974†	3.1	10.6	5.7
1975	4.6	16.0	7.3
1976	3.7	18.8	6.9
1977	3.0	15.3	5.7
1978	3.0	9.0	4.3
1979	2.7	8.3	4.3
1980	3.9	12.0	5.3
1981	4.1	11.8	5.8
1982	3.9	13.0	6.3
1983	5.0	16.5	6.9
1984	4.6	13.2	7.0
1985	4.7	15.9	6.3
1986	4.7	16.1	7.0
1987	4.0	11.4	5.8
1988	4.4	11.9	6.0
1989	2.7	13.1	6.0
1990	3.6	12.9	5.5
1991	3.2	11.6	5.4
1992	3.2	5.6	4.3
1993	3.1	13.6	5.2

* No data available.

** Includes TLD numbers 3, 4, 5, 6 and 7 (1970 - 1973). Includes TLD numbers 3, 4, 5, 6, 7, 23, 24, 25 and 26 (1974 - 1993). Locations are existing or previous on-site environmental air monitoring locations.

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-16E

HISTORICAL ENVIRONMENTAL SAMPLE DATA

ENVIRONMENTAL TLD

Results in mrem per standard month

LOCATION: OFF-SITE INDICATOR **			
Year	Min.	Max.	Mean
Preopt	*	*	*
1970	5.0	8.0	6.7
1971	1.1	7.7	4.5
1972	1.8	6.6	4.4
1973	2.2	6.9	4.1
1974†	2.4	8.9	5.3
1975	4.5	7.1	5.5
1976	3.4	7.2	5.2
1977	3.7	8.0	5.3
1978	2.7	4.7	3.7
1979	3.0	5.7	4.0
1980	3.1	5.8	4.6
1981	3.6	5.9	4.7
1982	4.0	6.2	5.2
1983	4.6	7.2	5.6
1984	4.6	8.2	6.1
1985	4.6	7.7	5.5
1986	5.0	7.6	6.1
1987	4.4	6.6	5.2
1988	4.2	6.6	5.4
1989	2.8	6.4	4.6
1990	3.8	6.1	4.8
1991	3.4	5.8	4.5
1992	3.1	5.2	4.1
1993	3.2	5.7	5.0

* No data available.

** Includes TLD numbers 8, 9, 10, 11, 12 and 13 (off-site environmental air monitoring locations).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-17

HISTORICAL ENVIRONMENTAL SAMPLE DATA

MILK

Results in pCi/liter

LOCATION: CONTROL **						
Isotope	Cs-137			I-131		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	*	*	*	*	*	*
1974†	*	*	*	*	*	*
1975	*	*	*	*	*	*
1976	*	*	*	*	*	*
1977	*	*	*	*	*	*
1978	2.4	7.8	5.8	<LLD	<LLD	<LLD
1979	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1980	<LLD	<LLD	<LLD	1.4	1.4	1.4
1981	7.0	7.0	7.0	<LLD	<LLD	<LLD
1982	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	5.3	12.4	8.4	0.8	29.0	13.6
1987	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* No data available (sample not required).

** Location used was an available milk sample location in a least prevalent wind direction greater than ten miles from the site.

† 1969 data is consied to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

TABLE 7-18

HISTORICAL ENVIRONMENTAL SAMPLE

MILK

Results in pCi/liter

LOCATION: INDICATOR **						
Isotope	Cs-137			I-131		
Year	Min.	Max.	Mean	Min.	Max.	Mean
1969†	**	**	**	**	**	**
1974†	1.6	39	10.5	0.70	2.00	1.23
1975	6.0	22	16	0.01	2.99	0.37
1976	4.0	15.0	9.3	0.02	45.00	3.20
1977	11.0	22.0	17.1	0.40	0.22	0.02
1978	3.4	33.0	9.9	0.19	0.19	0.19
1979	2.7	40.0	9.4	<LLD	<LLD	<LLD
1980	4.0	21.0	9.7	0.4	8.8	4.9
1981	4.3	29.0	7.6	<LLD	<LLD	<LLD
1982	3.1	18.0	6.3	<LLD	<LLD	<LLD
1983	5.1	5.1	5.1	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1986	6.1	11.1	8.6	0.3	30.0	5.2
1987	5.5	9.4	7.4	<LLD	<LLD	<LLD
1988	10.0	10.0	10.0	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
1993††	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

* Locations sampled were available downwind locations within ten miles with high deposition potential.

** No data available (control samples not required).

† 1969 data is consied to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

†† New control location as of August 16, 1993. Location No. 65 sold - last sample taken August 2, 1993.

TABLE 7-19

HISTORICAL ENVIRONMENTAL SAMPLE DATA

FOOD PRODUCTS ††

Results in pCi/g (wet)

LOCATION: CONTROL *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	**	**	**
1975	**	**	**
1976	**	**	**
1977	**	**	**
1978	**	**	**
1979	**	**	**
1980	<LLD	<LLD	<LLD
1981	<LLD	<LLD	<LLD
1982	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	<LLD	<LLD	<LLD
1986	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD
1988	<LLD	<LLD	<LLD
1989	<LLD	<LLD	<LLD
1990	<LLD	<LLD	<LLD
1991	<LLD	<LLD	<LLD
1992	<LLD	<LLD	<LLD
1993	0.008	0.008	0.008

* Locations was an available food product sample location in a least prevalent wind direction greater than ten miles from the site.

** No data available (control samples not required).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

†† Data comprised of broadleaf and non-broadleaf vegetaion (1980-1984). Data comprised of broadleaf vegetation only (1985-1991).

TABLE 7-20

HISTORICAL ENVIRONMENTAL SAMPLE DATA

FOOD PRODUCTS ††

Results in pCi/g (wet)

LOCATION: INDICATOR *			
Isotope	Cs-137		
Year	Min.	Max.	Mean
1969†	**	**	**
1974†	0.04	0.34	0.142
1975	<MDL	<MDL	<MDL
1976	<MDL	<MDL	<MDL
1977	<MDL	<MDL	<MDL
1978	0.01	0.01	0.01
1979	<LLD	<LLD	<LLD
1980	0.004	0.060	0.033
1981	<LLD	<LLD	<LLD
1982	<LLD	<LLD	<LLD
1983	<LLD	<LLD	<LLD
1984	<LLD	<LLD	<LLD
1985	0.047	0.047	0.047
1986	<LLD	<LLD	<LLD
1987	<LLD	<LLD	<LLD
1988	0.008	0.008	0.008
1989	0.011	0.011	0.011
1990	<LLD	<LLD	<LLD
1991	0.039	0.039	0.039
1992	<LLD	<LLD	<LLD
1993	<LLD	<LLD	<LLD

* Indicator locations were available downwind locations within ten miles of the site and with high deposition potential.

** No data available (control samples not required).

† 1969 data is considered to be pre-operational for the site. 1974 data is considered to be pre-operational for the JAFNPP.

†† Data comprised of broadleaf and non-broadleaf vegetaion (1976-1984). Data comprised of broadleaf vegetation only (1985-1991).

8.0 GRAPHICAL PRESENTATIONS

1. DATA GRAPHS

This section includes graphic representation of selected sample results.

For graphic representation, results reported as MDL or LLD were considered to be at the "zero" level of activity. MDL and LLD results were indicated where possible.

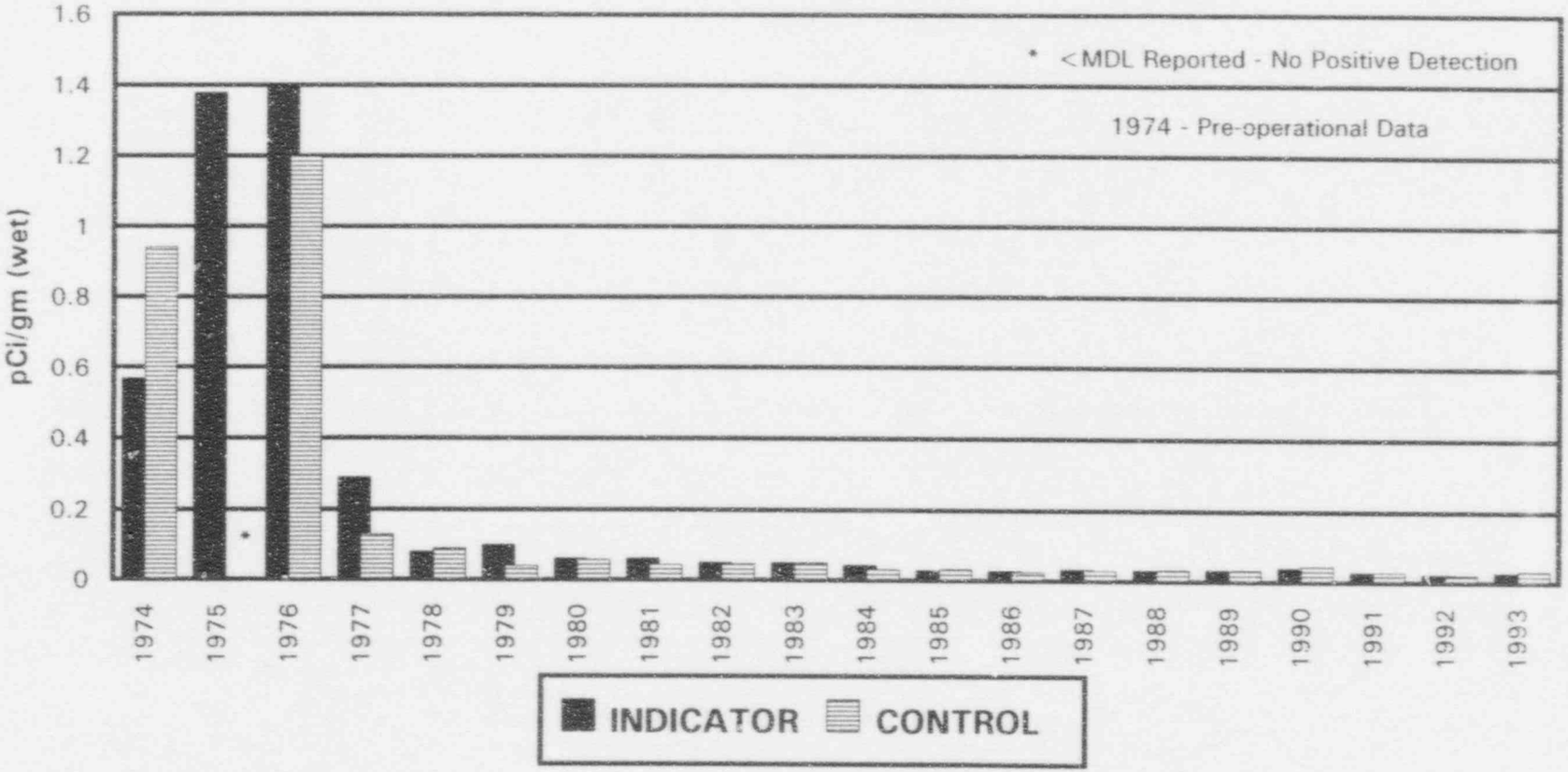
2. SAMPLE LOCATIONS

Sample location results specified as "indicator" and "control" on the graphs can be referenced back to Section 3.3 for specific locations.

JAMES A. FITZPATRICK N.P.P.

FISH Cs-137

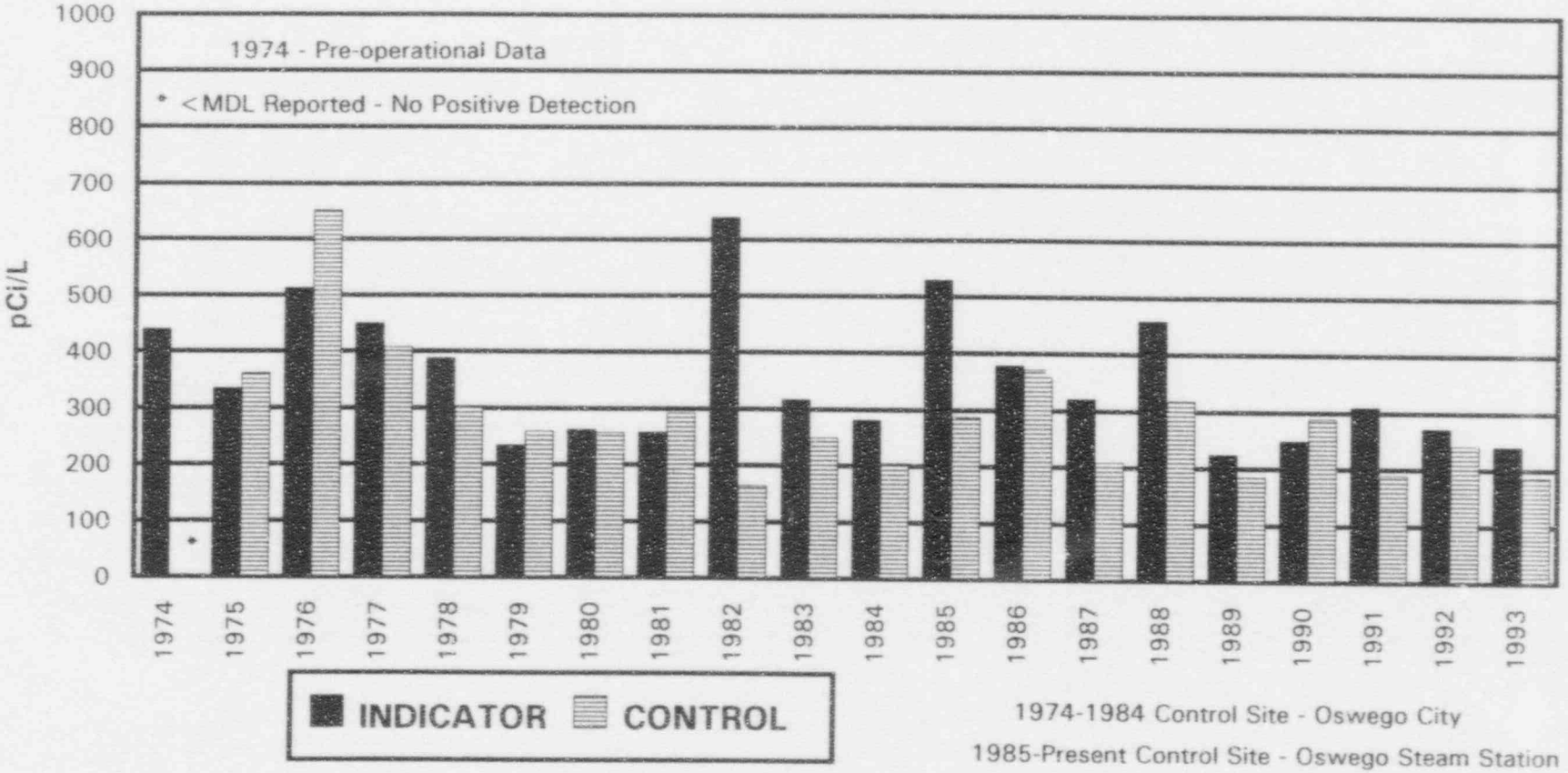
Figure 8.1



JAMES A. FITZPATRICK N.P.P.

SURFACE WATER TRITIUM

Figure 8.2



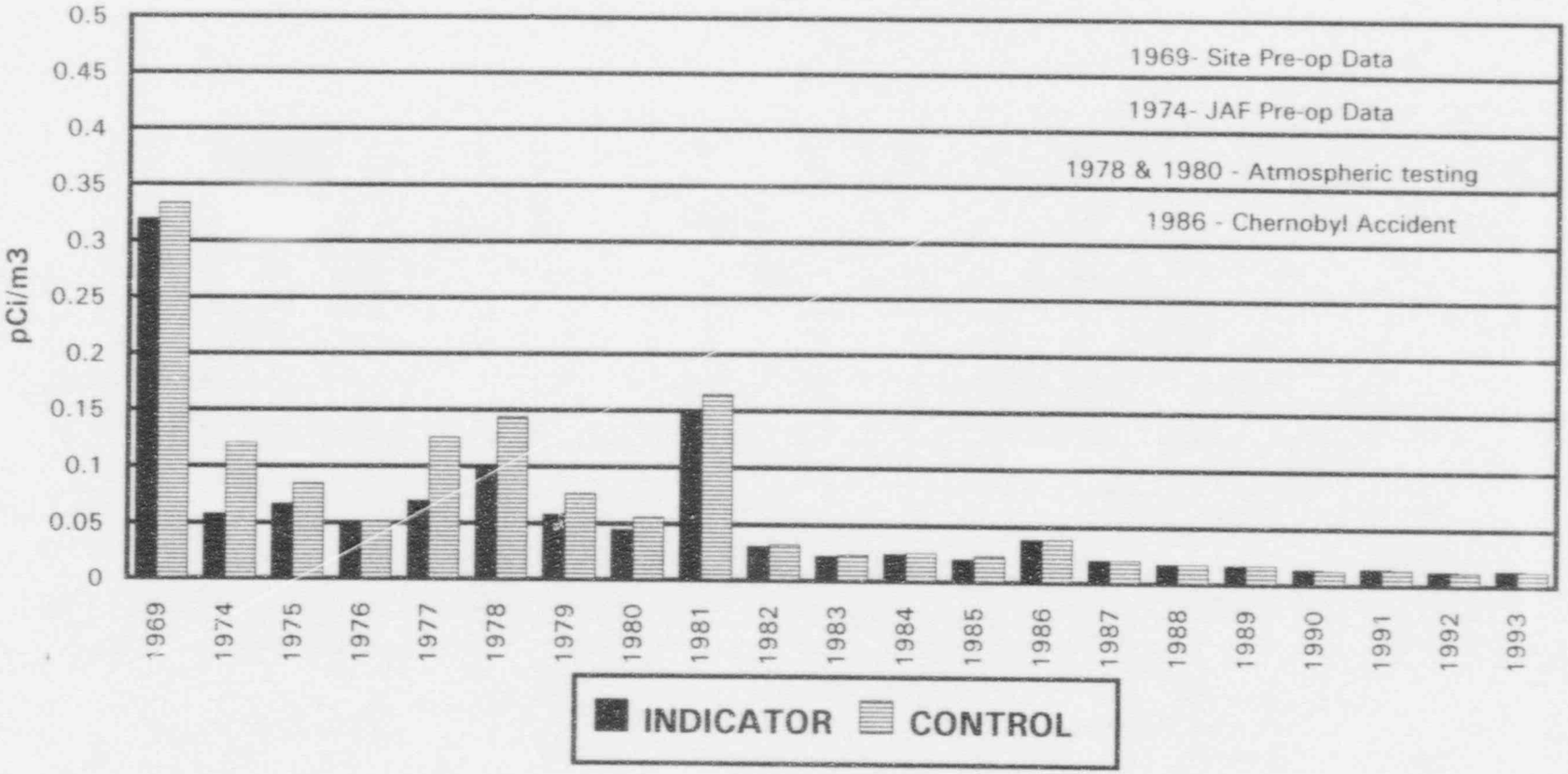
1974-1984 Control Site - Oswego City

1985-Present Control Site - Oswego Steam Station

JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER-GROSS BETA

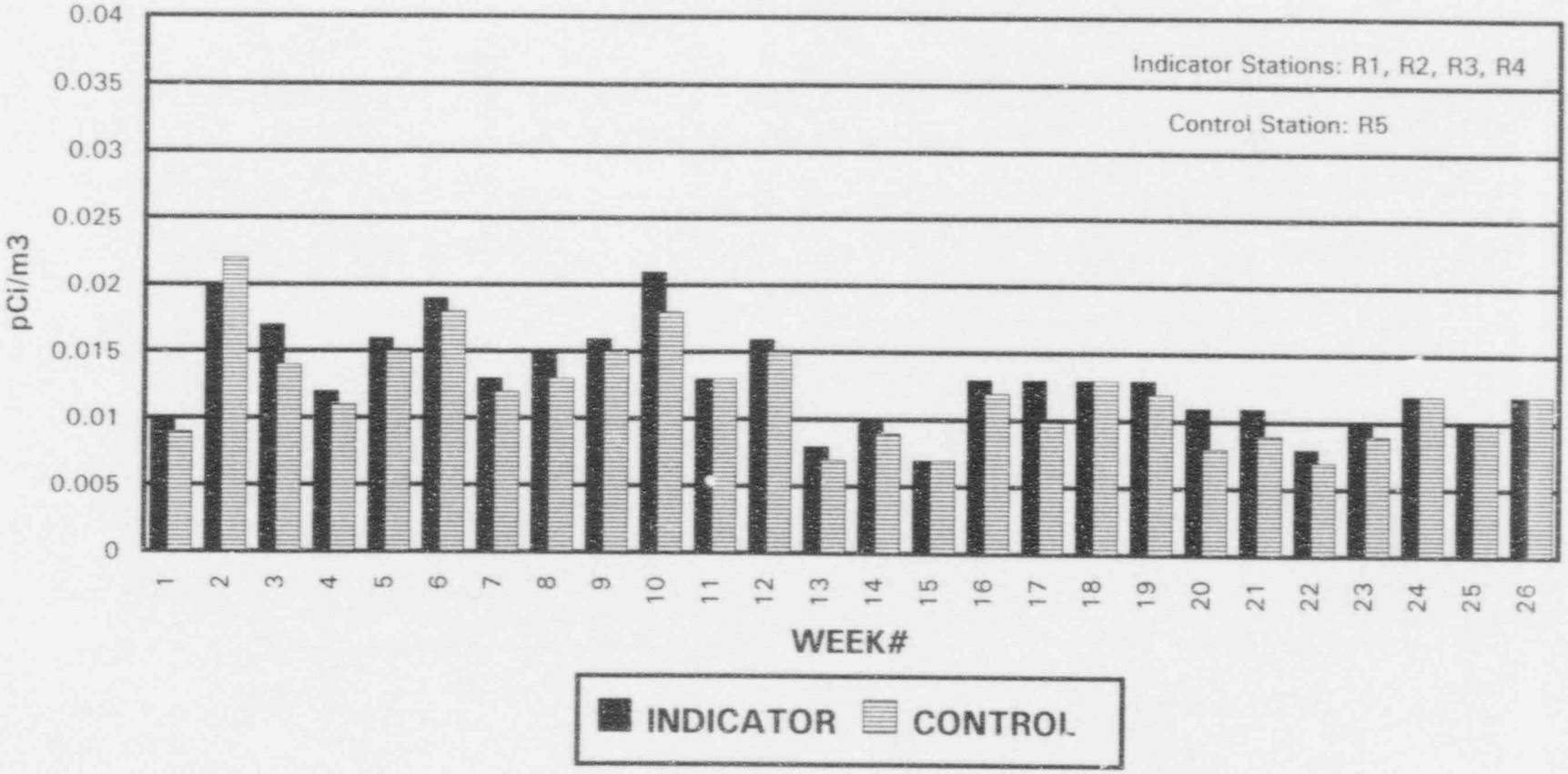
Figure 8.3



JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER-GROSS BETA

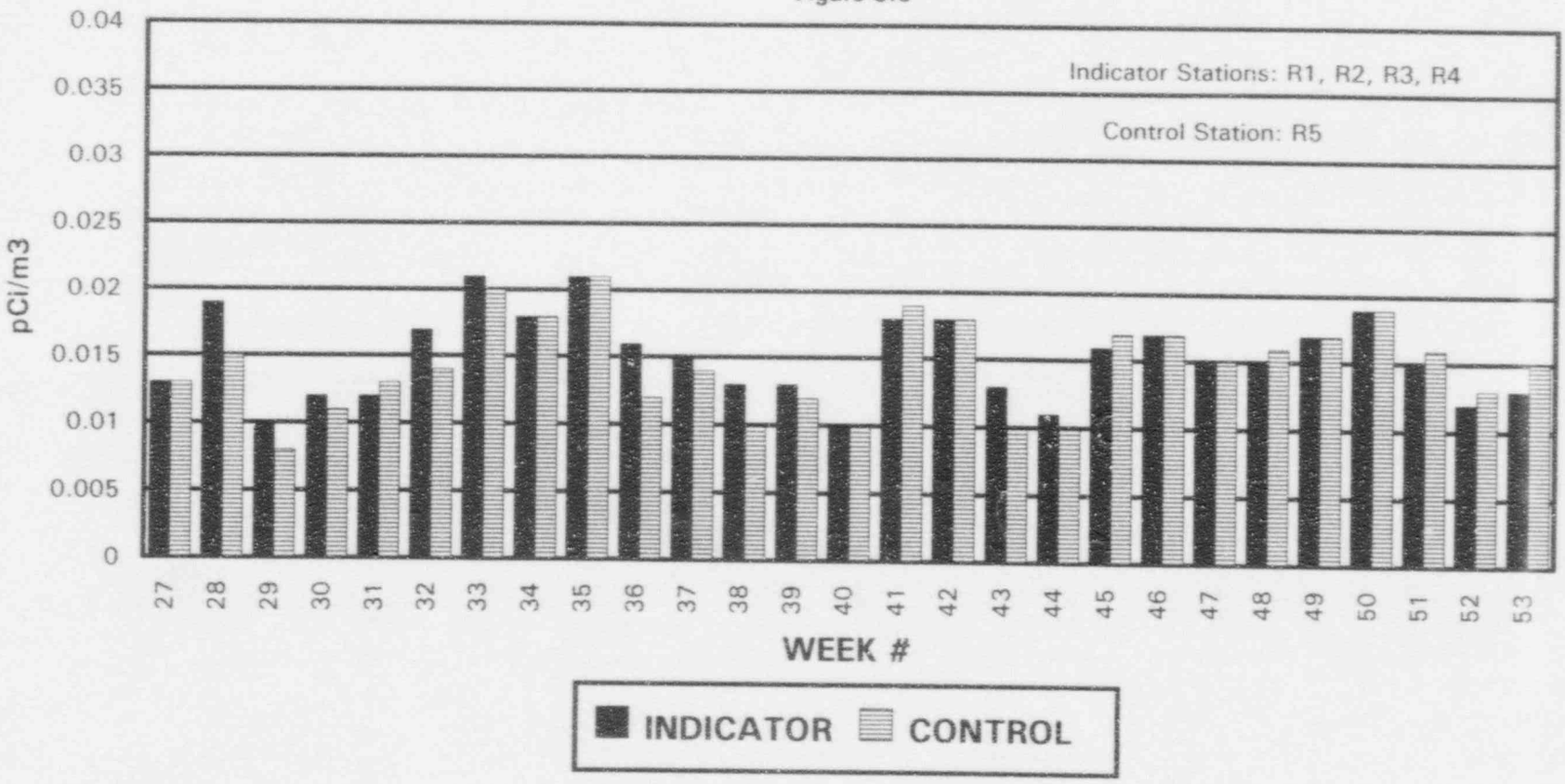
Figure 8.4



JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER-GROSS BETA

Figure 8.5



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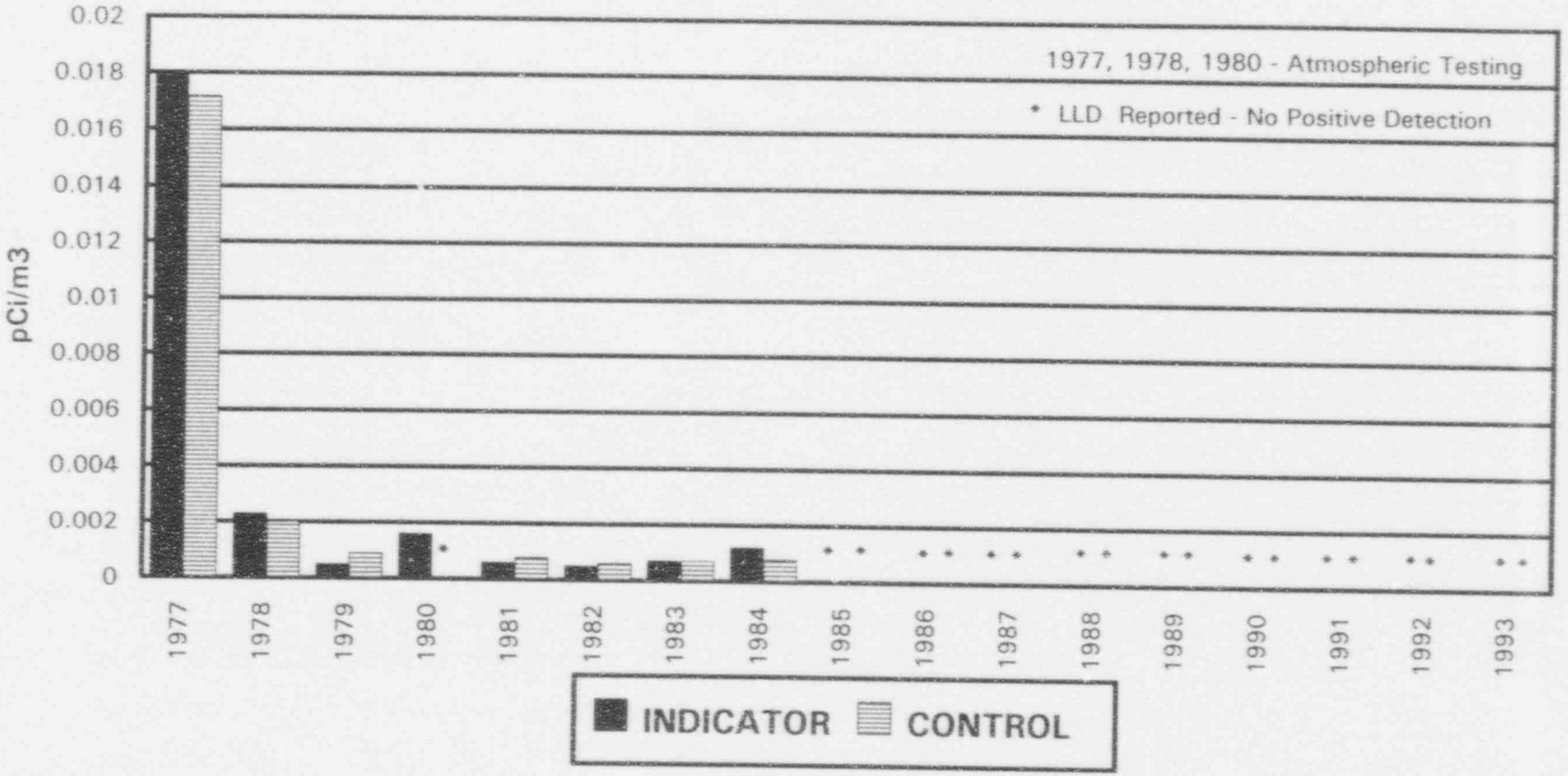
AIR PARTICULATE FILTER COMPOSITE Co-60

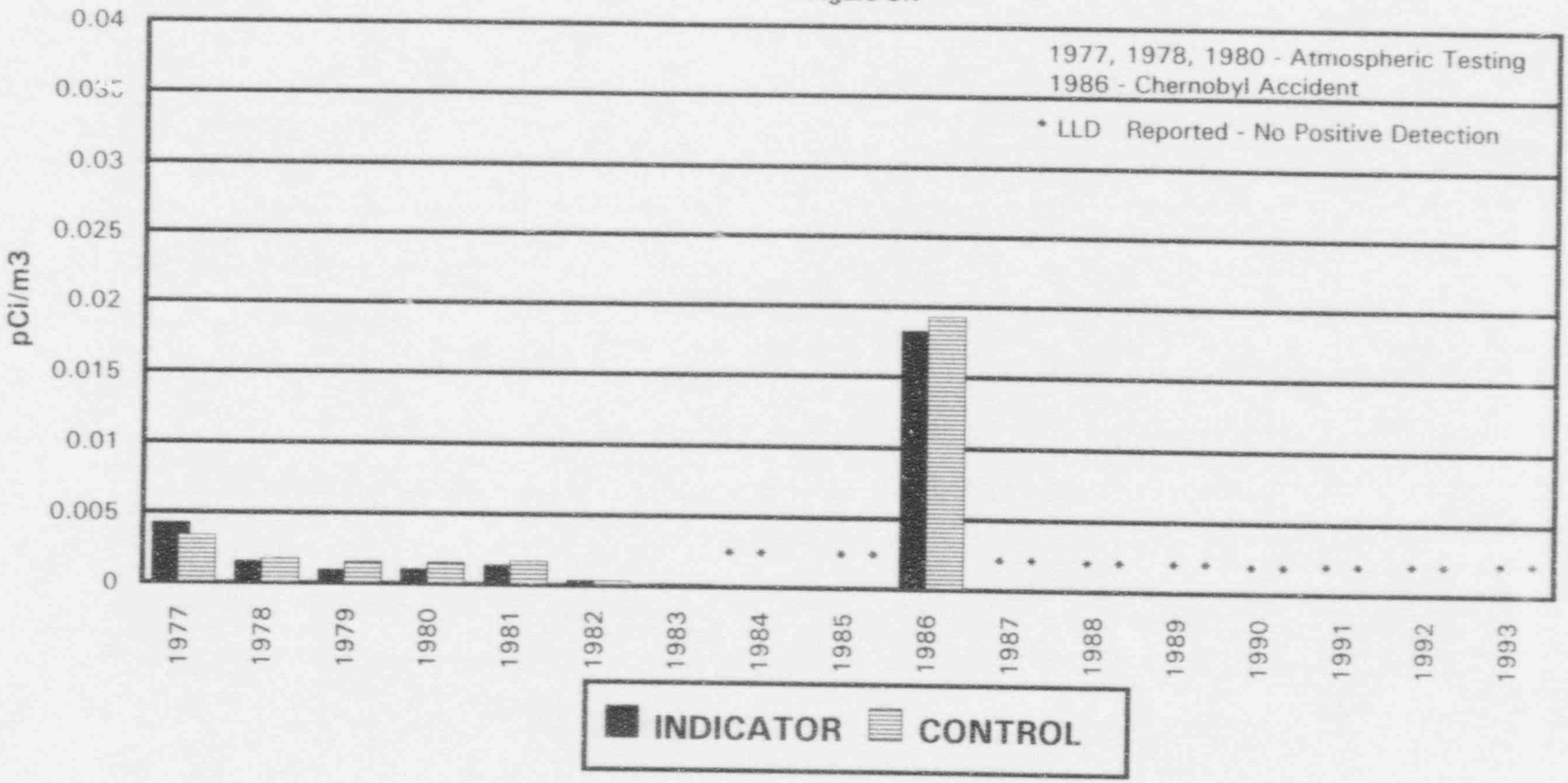
Figure 8.6



JAMES A. FITZPATRICK N.P.P.

AIR PARTICULATE FILTER COMPOSITE Cs-137

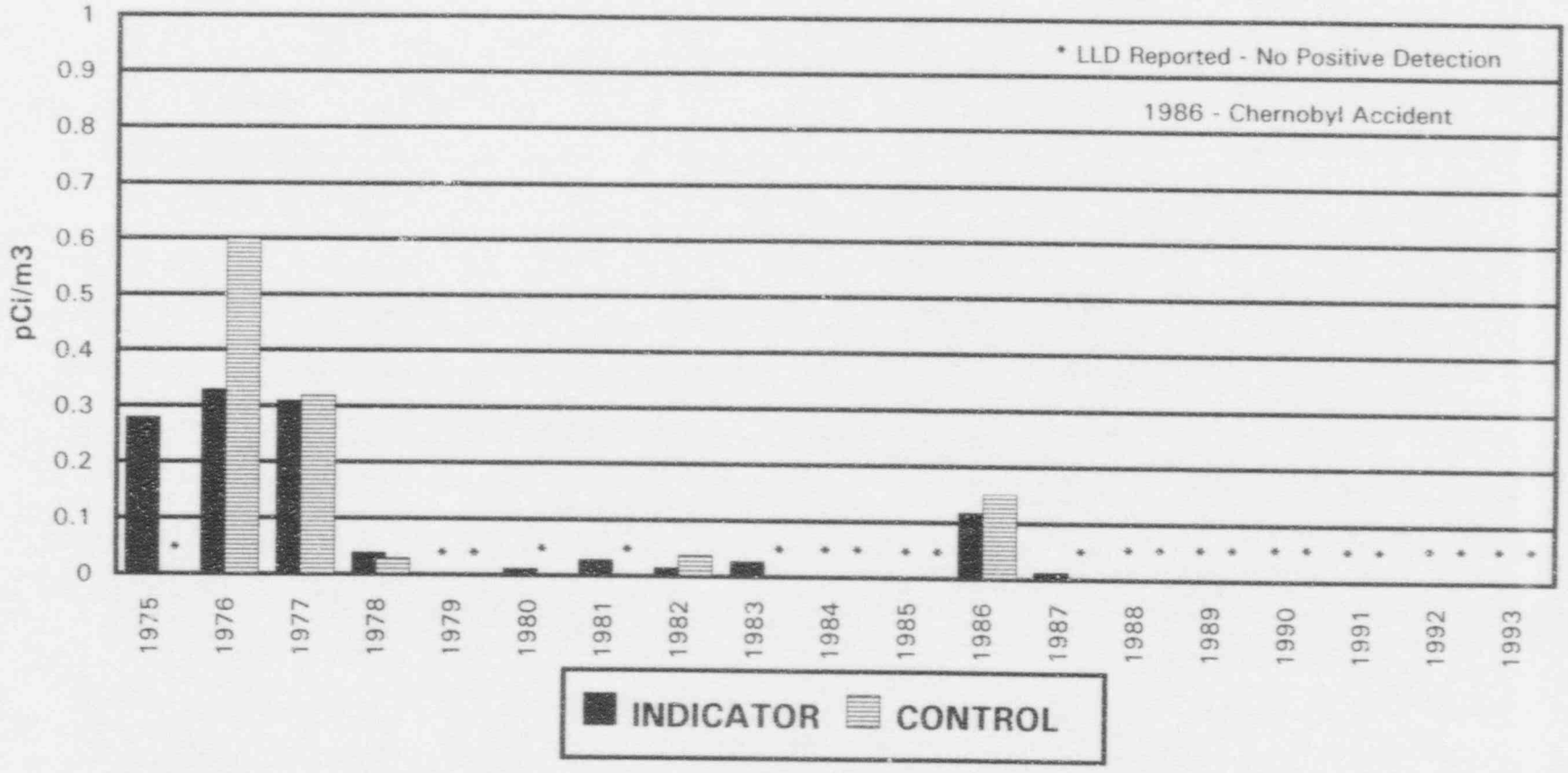
Figure 8.7



JAMES A. FITZPATRICK N.P.P.

AIR-RADIOIODINE I-131

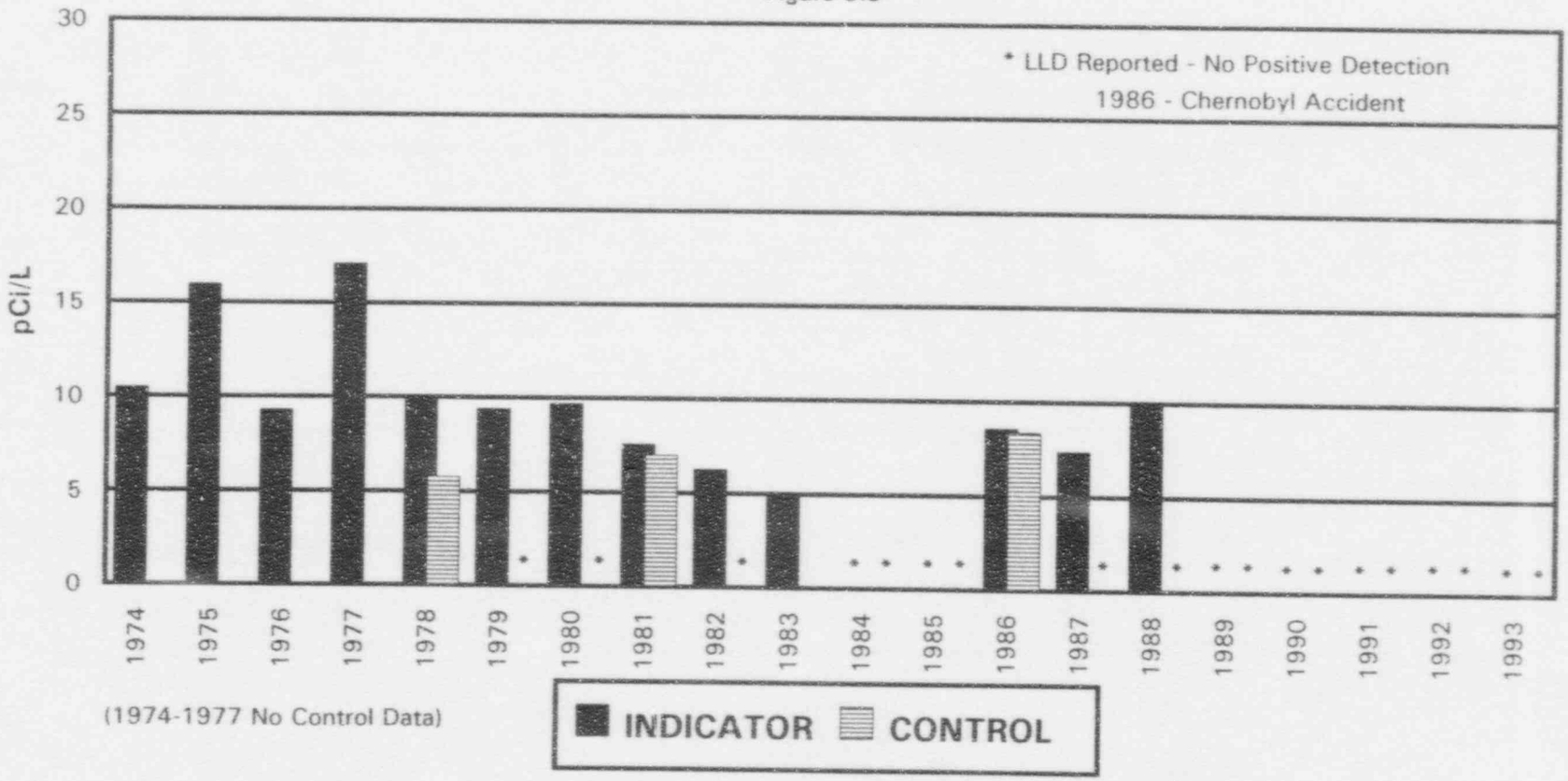
Figure 8.8



JAMES A. FITZPATRICK N.P.P.

MILK Cs-137

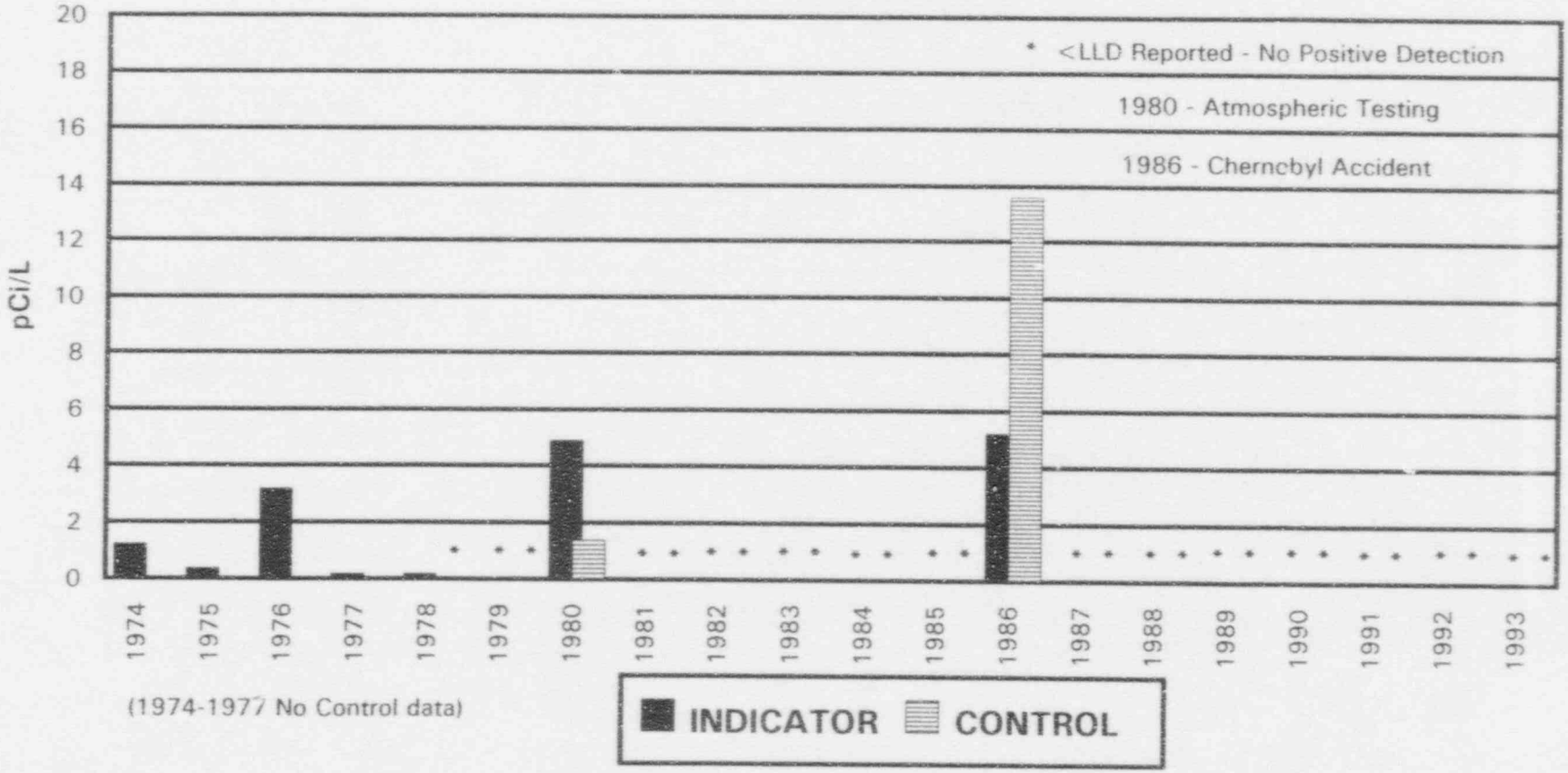
Figure 8.9



JAMES A. FITZPATRICK N.P.P.

MILK RADIOIODINE I-131

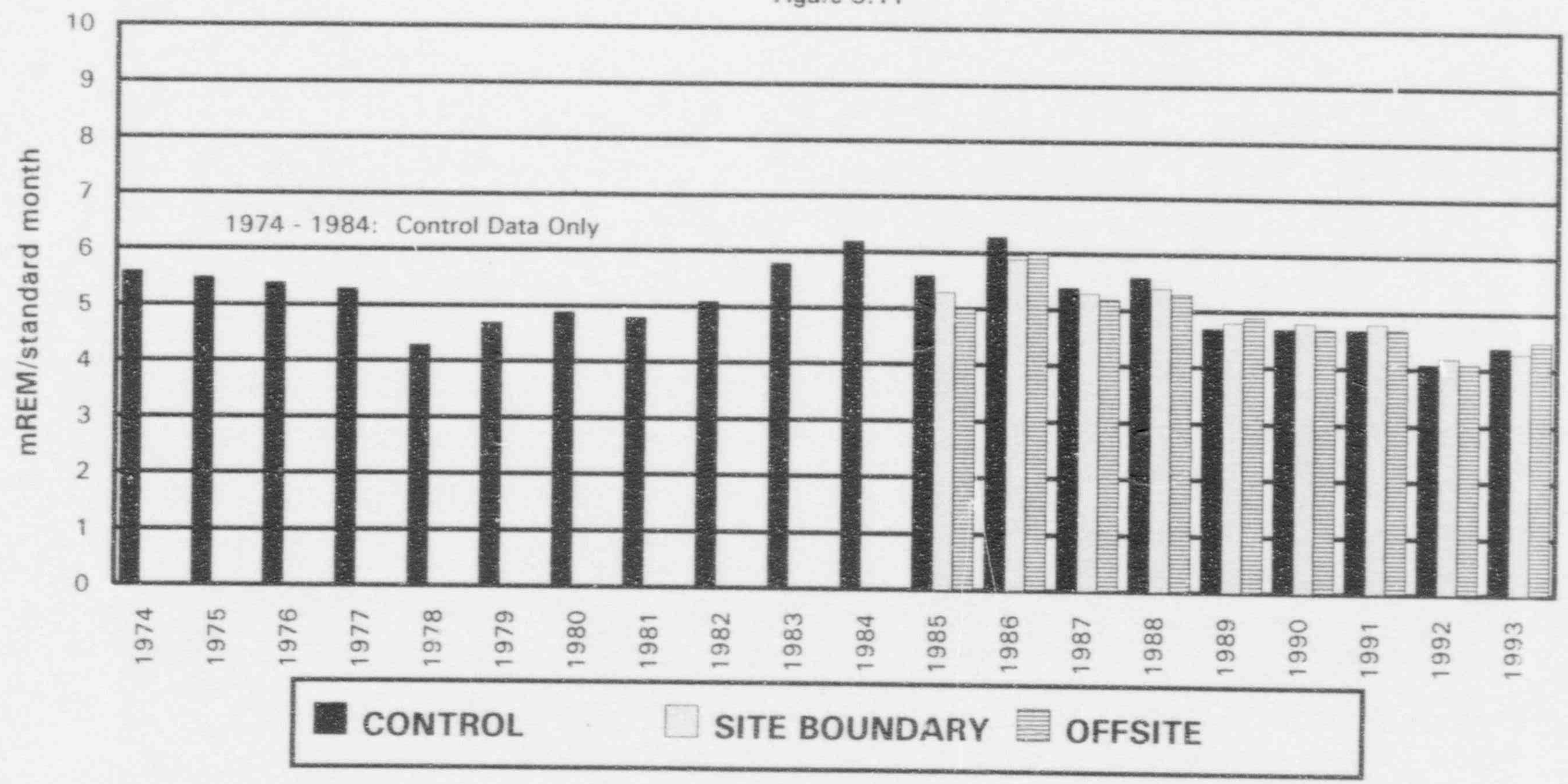
Figure 8-10



JAMES A. FITZPATRICK N.P.P.

TLD DATA

Figure 8.11



9.0 QA/QC PROGRAM

9.1 PROGRAM DESCRIPTION

The Radiological Effluent Technical Specifications require that a summary of the results for participation in the Interlaboratory Comparison Program be included in the Annual Radiological Environmental Operating Report. Reference samples obtained from the US Environmental Protection Agency (USEPA) Cross Check Program are analyzed by the JAFNPP Environmental Laboratory. Sample media analyzed for the intercomparison program includes those which are routinely obtained as part of the site radiological environmental monitoring program.

Sample results are compared to the USEPA reference results for accuracy and precision. The USEPA reports results in terms of Normalized Deviations from a Known Value (NDKV). Interlaboratory results are acceptable by the USEPA when the laboratory NDKV is between -3 and +3 NDKV.

9.2 PROGRAM RESULTS

The performance of the JAFNPP Environmental Laboratory was acceptable in 1993. The USEPA provided 29 radionuclides, contained in various environmental media for analysis. Of these 29 radionuclides, the Laboratory reported 28 results within the range of -2 NDKV and +2 NDKV. The one sample result that was >-3 NDKV is addressed in Section 9.3.

All six samples analyzed by the program vendor laboratory were acceptable. Specific results for the USEPA Cross Check Program are presented in Tables 9-1 through 9-4 contained in this section.

9.3 NONCONFORMITIES

9.3.1 Sample 93-078, Gamma in Water, contained six radionuclides, Co-60, Zn-65, Ru-106, Cs-134, Cs-137 and Ba-133. The NDKV for Ru-106 was -3.13.

The USEPA known activity for Ru-106 was 119±12 pCi/l. The Environmental Laboratory reported a mean result of 97±9 pCi/l. The Environmental Laboratory staff routinely uses a factor of 1.13 to correct an inconsistency in the published gamma yield factor. The results were not corrected prior to submittal to the EPA for evaluation. The corrected results is 113 pCi/l. The appropriate NDKV for the 113 pCi/l results is -0.82 which is well within the acceptable range for the EPA evaluation criteria.

The other five radionuclides in this sample were within one standard deviation from the known (NDKV), indicating no systematic error.

TABLE 9-1

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY

INTERCOMPARISON STUDY PROGRAM

GROSS BETA ANALYSIS OF AIR PARTICULATE FILTERS (pCi/FILTER)
GROSS BETA ANALYSIS OF WATER (pCi/LITER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
01/93	QA 93-005	WATER	GB	45±1 41±1 42±1	44±5	-0.46
07/93	QA 93-099	WATER	GB	38±1 40±1 38±1	43±6.9	-1.08
08/93	QA 93-123	FILTER	GB	52±1 52±1 50±1	47±5	1.50
10/93	QA 93-167	WATER	GB	51±1 50±1 53±1	58±10	-1.15
11/93	QA 93-187	WATER	GB	14±1 15±1 16±1	15±5	0.00

TABLE 9-2

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY

INTERCOMPARISON STUDY PROGRAM

TRITIUM ANALYSIS OF WATER (PCI/LITER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
06/93	QA 93-068	WATER	H-3	9344±137(3)	9844±984	-0.69
				9525±138		
				9740±137		
				9800±300(4)	9844±984	-0.08
				9800±300		
				9800±300		
11/93	QA 93-185	WATER	H-3	7157±126(3)	7398±470	-0.74
				7078±125		
				7016±125		
				6900±300(4)	7398±740	-1.16
				7000±300		
				6800±300		

TABLE 9-3

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY

INTERCOMPARISON STUDY PROGRAM

IODINE ANALYSIS OF WATER (PCI/LITER) AND MILK (PCI/LITER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
02/93	QA 93-020	WATER	I-131	99±2 98±2 98±2	110±10 110±10 100±10	-0.29
09/93	QA 93-154	MILK	I-131	117±2 115±2 118±2	120±12	-0.48
10/93	QA 93-066	WATER	I-131	120±2 120±2 119±2	117±12	0.38

TABLE 9-4

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER) AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
04/93	QA 93-045	WATER	Cs-134	23±1 25±1 23±2	27±5	-1.15
			Co-60	40±2 38±2 37±2	39±5	-0.23
			Cs-137	31±2 32±2 30±3	32±5	-0.35
06/93	QA 93-078	WATER	Co-60	13±1 14±1 13±1	15±5	-0.58
			Zn-65	109±5 106±5 98±5	103±10	0.23
			Ru-106	76±14 114±17 102±16	119±12	-3.13
			Cs-134	4±1 4±1 5±1	5±5	-0.23
			Cs-137	6±1 5±2 5±2	5±5	0.12
			Ba-133	99±3 97±3 90±3	99±10	-0.64

TABLE 9-4 (CONTINUED)

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY

INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER)
AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
08/93	QA 93-123	FILTER	Cs-137	8±2 7±2 9±2	9±5	-0.35
09/93	QA 93-154	MILK	Cs-137	49±4 48±4 44±4	49±5	-0.73
10/93	QA 93-167	WATER	Co-60	9±1 10±1 11±1	10±5	0.00
			Cs-134	9±1 9±1 10±1	12±5	-0.92
			Cs-137	11±1 11±1 10±1	10±5	0.23

TABLE 9-4 (CONTINUED)

USEPA ENVIRONMENTAL RADIOACTIVITY LABORATORY

INTERCOMPARISON STUDY PROGRAM

GAMMA ANALYSIS OF MILK, WATER (pCi/LITER)
AND AIR PARTICULATE FILTERS (pCi/FILTER)

DATE	JAF ENV ID NUMBER	MEDIUM	ANALYSIS	JAF RESULT (1)	EPA RESULT (2)	NDKV (5)
11/93	QA 93-186	WATER	Co-60	30±2 29±2 30±1	30±5	-0.12
			Zn-65	154±7 157±8 158±6	150±5	0.73
			Ru-106	172±20 177±22 188±16	201±20	-1.91
			Cs-134	55±2 54±2 56±2	59±5	-1.39
			Cs-137	39±2 41±2 42±2	40±5	0.23
			Ba-133	80±3 81±3 82±3	79±8	0.43

(1) Results reported as activity ± 1 sigma.

(2) Results reported as activity ± 1 sigma.

(3) Analyzed at the site Environmental Laboratory.

(4) Analyzed at a vendor laboratory.

(5) NDKV is the Normalized Deviation from Known Value as determined by the EPA. Values within the range of +3 and -3 indicate acceptable results.